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CONTENTS.

EDITORIALS:
Developing the Use of the Electric Vehicle.....849
The Problem of Rates.....850
Developing Special Lighting Applications.....850
Ousting the Gas Engine.....851
DEPARTMENTS:
Commercial Practice.....859
Electrical Construction.....864
National Association of Electrical Inspectors.....870
Legal Notes.....873
New Electrical and Mechanical Appliances.....885
Latest Approved Fittings.....888
Current Electrical News.....889
Record of Electrical Patents.....895
Electric Vehicle Section.....897
LEADING ARTICLES:
Church Lighting.....855
Co-Operation Between Electric-Vehicle Manufacturers and Central Stations.—By E. L. Callahan.....859
The Christmas Campaign.....861
The Electrical Work in a Modern Theater.....864
Central-Station Power Rates.....873
Association of Railway Electrical Engineers.....875
The Wheatstone Bridge in Telephone Practice.—By H. C. Lightfoot.....878
Legislation Affecting Public Utilities.—By H. V. Bozell.....881
Convention of Electric Vehicle Association of America.....897
MISCELLANEOUS:
Boston Section Meeting.....852
Society for Electrical Development Progress.....852
William Lincoln Smith.....853
Telephone Pioneers of America Make Changes in Constitution and By-Laws.....853
Vapor Pressure of Tungsten.....854
Electrical Equipment of Automobiles.....854
Southern Electrical Jobbers Visit Chattanooga.....854
Oklahoma Gas & Electric Company Helps in Water Famine.....862
House-Wiring Campaign in St. Louis.....862
Utility Development at Fargo, N. D.....863
House-Wiring Rates in Muncie.....863
Sign Manufacturers Organize.....863
E. S. Cowie.....869
Among the Contractors.....869
Progress of Power Supply on the Rand.....875
Navy Flatiron Specifications.....877
Plant Growth Under Electric Light.....880

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DEVELOPING THE USE OF THE ELECTRIC VEHICLE.

While many of the central stations in the larger cities have been devoting considerable thought and energy to extending the use of electric vehicles, especially the electric truck, it is painfully evident that in many of the smaller cities there is entirely too little activity along this line. Since the companies in these cases must be regarded as looking out for their own interests, such a condition can result only from ignorance of the possibilities and advantages to them of such use, or else from a lack of sufficient enterprise to adapt their policy to the times and direct their energies in new directions.

The electric power wagon has already demonstrated its efficiency, economy and adaptability in various lines of service and nothing more than an examination of operating records now available in many cities is necessary to convince the uninformed of these facts. The experimental stage is past. The purchaser of the electric truck need have no fear of disappointment where his needs are such as fall within the proper field for electric propulsion, and a portion of this field has been thoroughly defined, with, perhaps, certain extensions of it still undergoing demonstration. While the question of suitability and economy are not so well established for the passenger car, there are considerations making this the most satisfactory vehicle in large numbers of cases for passenger transportation. The new-business department of the central station need, therefore, have no misgivings about embarking in a campaign to push the electric vehicle and can have every confidence in the ultimate success of the service which it advocates. The establishment of an electric-vehicle section of the new-business department is thoroughly justified in the larger cities and in the smaller ones, where the extent of this department would not warrant it, it is at least incumbent upon the contract agent to see that some steps are taken to cover this field.

In the city of Chicago the central-station revenue from battery charging now amounts to $200,000 per year and is rapidly increasing. This represents an income of nearly 10 cents per capita, a figure which will no doubt be reached before the end of the present year. In New York City the yearly income is about $500,000, or about the same per capita. With a similar proportionate development, a town of 25,000 inhabitants should be able to build up a business along similar lines which would produce an income of $2,500 per year. This is an opportunity for business which should not be lost with-

out an effort. Information and energy on the part of the central station is perhaps the thing most needed to bring about the development, as the manufacturer of vehicles stands ready at all times to do his part in furthering it.

The Electric Vehicle Association of America has now been in existence for four years and has been doing valuable work in its field, as the annual convention held in Chicago and reported in this issue has shown. This association offers an opportunity to the central-station man to get in touch with developments in the vehicle field and prepare himself to properly push the use of electric vehicles in his own town. Affiliation in a movement which has the objects of this association can have no other effect than of benefit to the central station which is looking for an outlet for its product under most desirable conditions of use. It should be emphasized that battery charging can be made an entirely off-peak load.

THE PROBLEM OF RATES.

An opinion formulated by a well known legal authority, Mr. Louis D. Brandeis, which will be found in our Legal Notes this week, invites the study of every central-station manager or rate expert. The tendency for some years past, especially where legal authority has stepped in to limit the arbitrary schedules of the operating company, has been toward the establishment of rates which are based upon the cost of rendering service rather than upon the value of that service to the customer. The weight of court decisions and public service commission practice is in this direction, and while there are exceptions even in this field, the trend is strongly marked and must be regarded as the ultimate practical basis as well as the logical one for formulating schedules.

Mr. Brandeis points out that to have the sanction of legal authority, differences in rates to large and small consumers must be based upon actual differences in the cost of service and that a quantity discount based upon nothing more than the size of the account cannot be justified upon established principles of law. While such an opinion does not, of course, have the weight of a court decision, it is so strongly supported by the cases cited that there is strong probability of court decisions following the same line of logic when cases involving these considerations come up for hearing.

It is well recognized that the value of load-factor, as well as the time of the day and year when consumption takes place, are important elements in determining the cost of supplying electric service. Consequently, differences in rates based upon such a distinction are entirely justifiable. This would cover differences in schedules for lighting, power, battery-charging, furnace operation and any other class of service which has distinct characteristics in regard to the time and length of operation. In some other utility service the time of consumption is of little or no importance, and from the standpoint of Mr. Brandeis, differences in rates depending upon the use to which service is applied is not in this case a sufficient justification for a difference in rates. Nevertheless, such differences have been authorized in certain cases, as for instance where gas is used for lighting or heating purposes. If the contention of Mr. Brandeis were to hold, many of the rates now in force for electric, gas and telephone service would be invalidated.

As regards quantity discounts, it may be maintained that the cost of serving a large consumer is less than for a small one, even when the load-factor and other conditions are identical. While the cost of generating a unit of energy may be the same in such cases, the cost of distribution, meter reading, keeping accounts, etc., may well be less for the large consumer. The hypothesis at the basis of this legal opinion consequently may be one which does not correspond to any actual conditions of service.

Central-station companies should, with the development of a more logical theory of rates, be prepared to make readjustments to such ideas as are expressed in this opinion, since they are backed by sound logic and also by numerous court decisions. It is undoubtedly a fact that many rates now in operation would not stand court scrutiny and have been put in operation from considerations of expediency rather than from any consideration of their legality or relation to cost of service.

DEVELOPING SPECIAL LIGHTING APPLICATIONS.

A very small amount of traveling among central stations is all that is needed to convince a new-business enthusiast that up to the present time the possibilities of special electric lighting have scarcely been touched, in view of what the next few years will show. Here is a field which is broad enough to occupy a large part of a lighting solicitor's time, despite the fact that most of the individual applications are small consumers of energy. A few examples will best indicate the desirability of such development, which will do more to advertise the value of electrical service on a larger scale from its convenience in small installations than a good many dollars' worth of follow-up letters and newspaper display advertisements.

There has recently been developed an adjustable tungsten side light for automobile service, which is certain to become one of the most valuable accessories of the modern car associated with ideas of safety and convenience. The use of this sort of device to locate curbings, to read guide boards, inspect engine and transmission mechanism, and to outline the borders of difficult roadways is sure to increase with experience, and in nine cases out of ten it means that some central station will do a little more battery charging on account of it. Again, the lighting of railroad stations by electricity consumed on a long-hour basis in place of less attractive and efficient agencies of illumination is becoming more general in suburban districts, and should be pushed by commercial departments as a desirable class of load. Nothing like the full usefulness

of the modern porch light is enjoyed by the great majority of householders to whom electricity has brought relief from the unwholesome gas jet and oil lamp; thousands of physicians have yet to be persuaded as to the value of low-wattage night-bell lamps which need but a trial to convince the user of their superiority; fire-alarm-box lighting by tungsten units can be extended on a scale of long-hour burning which deserves vigorous effort to secure such business; and the illumination of alleys leading to cafes in some of the older parts of our cities has only begun to be developed.

Long after the big city business houses are generally using artistic and effective lighting in their various departments there will be an opportunity for high-class applications in the small stores of residential and suburban regions—little establishments which thrive in spite of down-town competition through their ability to render immediate service on a basis of low rentals and moderate attendance costs within their capacities. Many of these places are today lighted by gas or oil; few are prospective consumers of energy on a large scale, but almost all offer attractive opportunities to the lighting solicitor with an eye toward the installation of improved lamps and reflectors, both for general interior work and for the concentration of light on particular displays. The tungsten lamp brings electricity at fair rates within the reach of nearly every progressive establishment of this kind from the Greek fruit dealer maintaining a stand in an aristocratic suburb to some humble shoemaker or tailor who toils long into the night six days a week, often alas, under conditions of lighting and ventilation which are anything but beneficial to his eyesight, health and rate of production.

The list of possible lighting applications which directly or indirectly can be stimulated to the enduring benefit of the central station need not be further extended at this time, but the solicitor who canvasses his territory with the help of a little imagination can note them down by the score. Granted the wisdom of seeking the larger business first, it none the less follows that every new installation of electricity, no matter on how small a scale, tends to develop business like a rolling snowball. The investment cost is small in the great majority of individual applications which meet some need which often has been unappreciated, and the operating cost also, with modern lamp and reflector equipment, is often merely nominal. No extension of electric service can be too small to be important in these days of growing popular interest in the industry; one successful application leads to another, and people in the same line of business, neighbors and friends, are all susceptible to improvements which come close home to their own observation. Just as it has paid some manufacturers to establish a small-motor department in which specialized applications are constantly considered and placed in service, so it will pay the energetic central station to put more energy into the vigorous solicitation of distinctive small-lighting business.

OUSTING THE GAS ENGINE.

The central-station power engineer working to install motor service in a factory at present operated by gas engines needs to make the most of every resource in order to win the day in cases where the plant owner insists on close figuring. The case of a typical installation is suggestive in this respect. Here the margin of cost depended upon the lighting conditions and price, and it was found that unless the illumination could be furnished at an energy charge averaging about 6.5 cents per kilowatt-hour the electric motor installation would have to be deferred.

There were a good many conditions favorable to the use of central-station service in the factory. In the original power installation the foundations of the steam engine then put in were improperly built, with the result that the weight of the engine caused the building to settle so much that it was impossible to keep the boiler setting steam-tight except at a prohibitive expense. The engine was sold and the boiler retained for heating service only. Two 25-horsepower gas engines were put into the establishment and trouble arose from the inability of the governors to properly control the supply of gas under varying loads. With one engine operating at full load the gas consumption was 8 cubic feet per minute, and as soon as the load increased enough to require the use of the second engine the demand for gas rose to 13 cubic feet per minute. The engines consumed practically a constant quantity of gas under a wide range of loads, which was greatly to the advantage of the electric service calculations. Again, it was found that the lighting required by the night watchman in cleaning the plant interior was in regular course obtained by driving a 2-kilowatt generator by a small gas engine used for no other purpose.

In the cost analysis due credit was given to these conditions, but on account of the close margin between electricity and gas it was found that the existing 12-cent rate for lighting would turn the scale in favor of the latter service. Now, the importance of dealing with problems of this kind comprehensively is not always realized by central stations, but it is clear that the lighting rates for industrial-plant service, much of which is well off the worst peaks of each month, should be carefully considered in relation to their possible influence upon the power business. Without for a moment advocating discrimination, it will be found by many central stations looking into this matter in closely contested bids for patronage that it will pay to re-cast their industrial lighting schedules enough to permit profitable combinations of motor and lighting service to be made at a total cost appreciably below the existing expense of factory power and illumination. In some cases consumers secure the same rate for lighting as for power by installing a motor-generator set, and feeding the lighting circuits from the generator side. Such a step in the utilization of the energy should have no bearing upon the question as to whether a consumer is entitled to a given rate.

Boston Section Meeting.

At the annual meeting of the Boston Edison Company Section, National Electric Light Association, held October 21, D. B. Rushmore, of the General Electric Company, presented an interesting paper on the use of electricity in the construction of the Panama Canal and in the operation of the waterway. About 1,000 motors will be used in the locks, and in operating pumps, bridges, emergency dams and gates. At the Stoney gate valves, 118 50-horsepower motors will be installed, and on the cylindrical valves at the locks 120 7-horsepower motors. The 46 pairs of gates will require 92 35-horsepower motors, and there will be 46 7-horsepower motors on the miter forcing machines, 80 7.5-horsepower hand-rail motors, 18 27-horsepower motors on the guard-valve machines, and 48 70-horsepower motors on the chain fenders. The process of towing vessels by means of the 35-ton electric locomotives was also described. Four locomotives will be used for each vessel. The speed of towing will be only two miles per hour.

T. E. Penard described the new load-dispatching system that is being worked out for the Boston Edison Company. At the main generating station a special diagram board is being installed for the load dispatcher. The upper portion of the board is of wood and the lower of slate panels. Ruby lamps of the telephone-exchange type will indicate the status of all oil switches on the high-tension system in the station, and the position of all disconnecting and oil switches outside the station will be indicated on the board by red plugs operated by hand, while black plugs will show switches that are open for repairs or testing. The dispatcher and an assistant work on 8-hour shifts, and to provide for emergency work a room is equipped with beds and cooking apparatus. A telephone for operating service only is provided, and a fire-alarm register to connect all substations and the Boston system with headquarters will be installed eventually.

The following officers were elected for the ensuing year: J. W. Cowles, president; C. H. Crockett and C. E. Greenwood, vice-presidents; J. J. Buckley, secretary; C. H. Miles, treasurer. W. H. Cole and C. S. Hadaway are the additional members of the executive committee.

Rubber Imports.

The importation of Indiarubber into the United States during the year ended June 30, 1913, amounted to 113,000,000 pounds, which sets a new record for quantity, although the value, $101,000,000, was somewhat less than for the previous year.

Meeting of the New York Companies Section.

The first fall meeting of the New York Companies Section of The National Electric Light Association was held at the Edison Auditorium, New York City, on October 20. Joseph B. McCall, president of the N. E. L. A. and of the Philadelphia Electric Company, was present and after a short address on Association affairs, conferred the Doherty Gold Medal upon T. F. Bludworth, of The New York Edison Company. This medal was awarded for the best paper presented before a Company Section during the year 1912 and was won on a paper entitled "Adaptability to Service."

H. M. Edwards, chairman of the Section, then introduced W. E. Freeman, recently appointed executive officer of the street railroad, gas and electric light interests in Cincinnati, who told in an intensely interesting manner some of his experiences while on a recent trip through Mexico.

New Officers for Baltimore Section.

Members of the Baltimore Consolidated Section of the National Electric Light Association have organized for the season of 1913-1914 by the election of the following officers: president, L. L. Heyden; vice-president, F. M. Weller; secretary, D. C. Bruce; treasurer, R. F. Bonsall; Executive Committee, R. H. Tillman, A. W. Bull, G. S. Colburn, J. T. Kelly, F. E. Ricketts, W. H. Cassell and H. B. Lohmeyer.

Herbert A. Wagner, vice-president of the Consolidated Gas, Electric Light and Power Company, announced a number of prize competitions for papers suggesting ways and means to improve the service of the company and increase efficiency of its service.

Electric Club of Chicago.

A rousing "get-together" meeting of the Electric Club of Chicago was held on October 23, with an attendance that closely approached the season's record. Many delegates attending the convention of the Association of Railway Electrical Engineers were present. An excellent entertainment was provided by local talent, comprising violin solos by William S. Taussig, flute solos by Pres. George C. Keech, slight-of-hand tricks by John Bagley and stories by James H. Delaney and Perry Boole. The entertainment program was in charge of Otis B. Duncan.

The Club voted unanimously in favor of the Constitutional amendments which provide for changing the fiscal year of the club to correspond with the calendar year.

Society for Electrical Development Progress.

A wave of renewed and increasing interest in the Society for Electrical Development has been noticeable all over the country during the past two weeks. The various campaigns for new members have been prosecuted with vigor and have been especially productive of results in Cleveland, Chicago, Pittsburgh, Philadelphia and smaller cities in the Middle West and on the Pacific Coast.

The Society now has members in every state in the Union except Maine, Delaware and North Dakota. The total membership at present approximates 700. This number doubtless will be considerably increased as the result of a special campaign now in progress.

The Campaign Committee of the Society, of which W. E. Robertson, of Buffalo, N. Y., is chairman, has enlisted the services of the salesmen employed by a large number of its members. These men, with the consent and co-operation of their companies, will devote the greater part of their time during November, which will be known as "Pioneer Month," to securing members for the Society. It is estimated that the efforts of about 1,500 men will be in this way put forth in behalf of the Society during November. The total amount of funds pledged to the Society's work is approaching $150,000 and it is believed that through this effort the $200,000 required will be available in December.

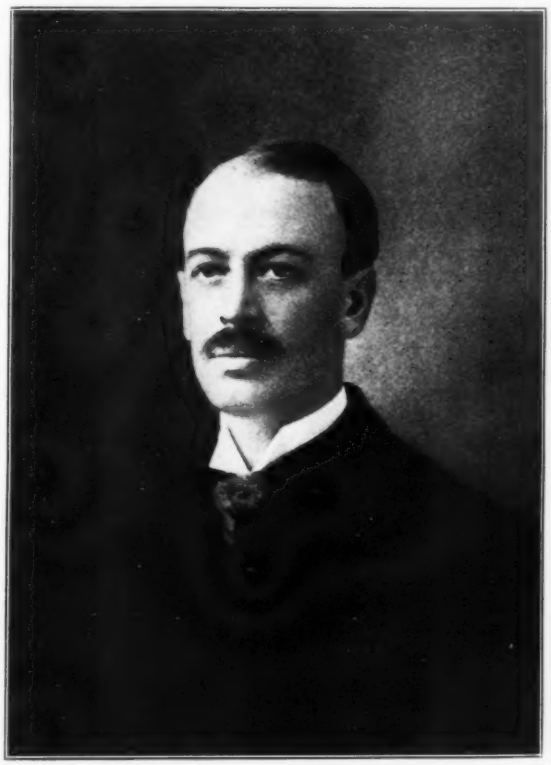
The Society has issued in pamphlet form the excellent address on "Electrical Co-operation," read by James H. Collins before the Jovian Congress at New York City on October 16, 1913. Mr. Collins, whose articles on business problems are familiar to readers of the *Saturday Evening Post*, has stated the advantages of membership in the Society in a broad and convincing manner. The paper is one that every electrical man should read. Copies will be supplied free on application to the Society for Electrical Development, 29 West Thirty-ninth Street, New York City.

Tennessee Plant Starts.

The second hydroelectric plant of the Tennessee Power Company, the principal operating subsidiary of the Tennessee Railway, Light & Power Company, was placed in operation on October 23. The construction of the plant was done by the J. G. White Engineering Corporation and, together with the first plant, will ultimately produce 68,000 horsepower. The total cost of the two plants has been about $5,000,000. The present capacity of the new plant is 20,000 horsepower and the current is transmitted over a high-tension line to Nashville.

William Lincoln Smith.

The importance of the efforts of the electrical inspector in the development of the industry is not always fully appreciated. The conscientious and aggressive inspector is always one of the principal and most influential exponents of continuous improvement in the materials and practices of electrical construction, and upon this the growth of the industry in no small measure depends. There are two large associations of inspectors in this country having for their object co-operative action in promoting improvement and progress along the line mentioned. One of these is the National Association of Electrical Inspectors, of which William Lincoln Smith, the subject of these notes, is the secretary. This body carries on a work that is unique among the activities of technical associations; in addition to the customary association work, an arrangement is maintained whereby practically any inspector in the country who needs it can readily secure the opinions of experts upon matters of such a kind that there is doubt as to just what the ruling of an inspector should be. Naturally, this sort of work draws very heavily upon the time and energies of the secretary of the association, through whose hands all such material has to pass, and in these times, when self-interest is so nearly the general rule among men, the service that Mr. Smith is rendering his fellow inspectors in this way is something that could hardly be too highly commended. But this sort of thing seems to be characteristic of the man.



William Lincoln Smith,
Secretary of the National Association of Electrical Inspectors.

Mr. Smith is a native of Massachusetts, and has spent most of his life in that state. He was born in Concord in 1867, and is descended from one of the oldest and best known families in his section of the country. He was educated at the Boston Latin School and at the Massachusetts Institute of Technology, having graduated at the latter school in 1890, with the degree of Bachelor of Science in Electrical Engineering. After graduation he spent a year abroad, traveling through Germany, France and other parts of Europe. Returning to this country, he took a position as an instructor in electrical engineering at the Massachusetts Institute of Technology, which place he resigned after a year or so in order to become a consulting engineer, and he has continued doing private consulting work in electrical and illuminating engineering ever since. In 1905 he was appointed municipal electrical inspector of Concord, in which capacity he still serves his town.

Mr. Smith's interest in educational matters led him, some eight years ago, to take charge of the electrical instruction provided by the Boston Young Men's Christian Association. He is still director of this department, in which 60 men are now taking four-year evening courses and 80 are enrolled as day students.

In 1894 he was married to Miss Grace Blanchard, of Concord, and two years after her death in 1902, he married Miss Mary Farnham, of Bangor, Me. His family includes six children, four sons and two daughters. He is a thirty-second degree Mason, and is active and prominent in the affairs of his community. Hard work carried on in co-operation with him is made lighter by his good judgment and genial, sympathetic disposition; to have him for a friend is one of the pleasantest of privileges.

Electrification of Canadian Pacific.

The Canadian Pacific Railway has been making preliminary experiments in the Rocky Mountain divisions on electrification. These are preliminary to a large amount of electrification work.

Telephone Pioneers of America Make Changes in Constitution and By-Laws.

At the annual meeting of the Telephone Pioneers of America, which was held at Chicago, on October 16 and 17, the following changes were made in the constitution and by-laws.

Section 1 of the constitution was amended to read as follows: "Any person of good standing employed in the telephone service or in its associate interests prior to the year 1891, or any person of good standing who has been continuously employed in the telephone service or in its associate interests for a period of twenty-one years, or any person of good standing who, in the judgment of the Executive Committee, shall have rendered special service beneficial to the telephone interests prior to the year 1891, may be enrolled for membership with the approval of the Executive Committee."

Section 3 of the constitution was amended to read as follows: "The President, Vice-President and Treasurer and three members of the Executive Committee shall be elected by ballott at each annual meeting and shall hold office until their successors are elected and have qualified. Two members of the Executive Committee shall be appointed by the President-elect and shall hold office until their successors are appointed. The Secretary shall be appointed by the Executive Committee."

Section 7 of the by-laws was amended to read as follows: "The Executive Committee shall be the governors of the Association and have power to fill vacancies in office or on committees as they occur and shall also have power to elect members and to verify and establish the original date of the alliance of such applicant or member with the industry, such date to be the officially recognized date. The Executive Committee shall also have power to expend in the interest of the Association any portion of the funds thereof."

Section 8 of the by-laws was amended to read as follows: "The membership shall consist of Honorary Pioneers and Pioneers. Honorary Pioneers shall be entitled to all the privileges of membership except that they shall not be entitled to vote or hold office."

Section 12 of the by-laws was amended so as to increase the annual dues.

Electrically Operated 75-Mile Aerial Cableway in Himalaya Mountains.

Plans are being perfected for starting work early next year on the construction of an aerial freight cableway, which is to be electrically operated, in the state of Kashmir to give access to the Vale of Kashmir from the plains of the Punjab in the northern part of India. This will be the longest cableway in the world, the longest one at present being about 22 miles in length, in Argentina. The ruggedness of the mountainous district leading to the Vale of Kashmir, together with the treacherous character of the frequent slips after heavy rains and the falling of huge bowlders, has made impracticable the construction of any ordinary railway. A monorail system was proposed at one time to make use of the Brennan principle, but it was impossible to find a right of way free from the difficulties mentioned.

A Canadian military engineer temporarily in the service of the Kashmir Government made an investigation of the feasibility of an aerial cableway, and after a London firm of bankers and engineering agents had made a supplementary survey, the project was declared to be completely practical and not unduly expensive. It is expected that the cost will be about $1,500,000. The cableway will be constructed in spans of about 2,400 feet, each with fixed cables upheld by iron pillars or towers of latticework, some of which will be 100 feet high. Two separate cableways will be constructed side by side about nine feet apart so as to permit uninterrupted transport of incoming and outgoing freight. The cable will be about 1.5 inches in diameter and will support steel cars holding 335 to 450 pounds of freight. These cars will be carried over great gorges and precipitious hills, in some cases spanning canyons of a depth of 1,200 feet. The cables will be separated into sections of about five miles in length and the cars will be transferred automatically from one section to another by means of large revolving drums which will effect release of the cars and their renewed gripping to the hauling ropes of the next section. A complicated system of springs thoroughly anchored with heavy counterweights will be used to take up the great expansion and contraction from heat and cold.

The cableway will be operated by electricity supplied from a hydroelectric plant near the town of Rampore. This plant was built under the directions of an American electrical engineer and equipped almost completely with American electrical machinery. It is probable that American manufacturers will have an opportunity to bid favorably for the supply of the material and machinery required for the new undertaking. Considerable power is already being supplied from the plant referred to for a series of electrically operated dredges that are widening the Jhelum River so as to prevent the serious floods that now are quite frequent. The dredges and motors for operating them were also supplied by American companies.

Vapor Pressure of Tungsten.

In a paper presented by Irving Langmuir before the American Physical Society on October 18, it was shown that the vapor pressure p of a substance is related to its rate of evaporation m in a vacuum by the following relation:

$$m = p \sqrt{(M/2\pi RT)}$$

where M is the molecular weight of the vapor.

Experiments were made to determine the rate of evaporation of tungsten in a vacuum at temperatures ranging from 2,440 up to 3,136 degrees on the Kelvin scale. Over this temperature interval of 700 the rate of evaporation increased in the ratio of 1:15000. From these data the vapor pressures were calculated and were found to agree excellently with the thermodynamical relations, such as the Clausius-Clapeyron formula. The latent heat of evaporation of solid tungsten is thus found to be (per 184 grams)

$$l = 217800 - 1.8\,T \text{ calories}$$

a value higher than the heat evolved by any known chemical reaction.

The rate of evaporation of tungsten at any temperature T in a perfect vacuum is given accurately by the equation

$$\log_{10} m = 15.402 - 47440/T - 1.4 \log_{10} T$$

where m is the rate of evaporation in grams per square centimeter per second.

The vapor pressure of tungsten in millimeters of mercury at the absolute temperature T is given by the equation

$$\log_{10} p = 15.502 - 47440/T - 0.9 \log_{10} T.$$

The vapor pressure of tungsten at 2,400 degrees Kelvin, the temperature of the filament in a lamp running at one watt per candle, is about 50×10^{-9} millimeters. At the melting point of tungsten, 3,540 degrees, the vapor pressure is 0.080 millimeter. The boiling point of tungsten at atmospheric pressure is probably very close to 5,200 degrees.

Electric Steel Plant for Indianapolis.

The Electric Steel Company of Indiana is erecting a plant at Indianapolis which will be equipped with an electric steel smelting and refining furnace with a capacity of 7,200 pounds. This will be of the arc type.

Electrical Equipment of Automobiles.

The 288th meeting of the American Institute of Electrical Engineers will be held in the auditorium of the Engineering Society Building, New York City, on November 14, at 8:15 p. m.

The general subject of the meeting will be "Electrical Equipment of Gasoline Automobiles," and three papers will be presented as follows: "Dynamo Electric Lighting for Motor Cars," by Alfred E. Waller; "Advantages of Clutch-Type Generators and of Separate Starting and Lighting Units for Motor Cars," by Alexander Churchward; and "Electrical Equipment of Gasoline Automobiles," by Frank Conrad.

The members of the Society of Automobile Engineers have been invited to participate at this meeting, and an interesting discussion is anticipated. At the close of the technical session, a smoker will be held.

Southern Electrical Jobbers Visit Chattanooga.

A number of Southern electrical jobbers visited Chattanooga, Tenn., on October 24, 25 and 26 to attend an informal meeting and discuss matters relating to several phases of their business The party met at Chattanooga on the morning of October 24, and proceeded to Signal Mountain Inn, where a delightful two and a half days of discussion, rest and recreation were indulged in. On Saturday afternoon the party visited the battlefields of Chickamauga and Missionary Ridge in automobiles, and on Saturday evening there was a very happy informal dinner at the Chattanooga Commercial Club. The visitors were the guests of the James Supply Company, of Chattanooga, I. L. Faucett, manager of the electrical supply department, acting as host.

Inspectors Use Motorcycles.

The city of Louisville has purchased several motorcycles for the use of its electrical inspectors, inability to cover the ground rapidly having resulted in inspection work falling behind, to the inconvenience of real-estate men and property owners. The Kentucky Actuarial Bureau, which does much of the inspection work at Louisville, is also using motorcycles.

Forest Products Exposition.

The first annual Forest Products Exposition will be held in 1914, appearing first at the Coliseum, Chicago, from April 30 to May 9, and later at the Grand Central Palace, New York City, from May 21 to 30. The manager of the Exposition is George S. Wood, 10 South La Salle Street, Chicago, Ill.

Church Lighting.

From every standpoint electricity is surely just as important in the church as it is in the place of amusement. Good lighting is essential if attendances at church services shall reach a maximum and remain there. Some general requirements of church lighting are presented in this article.

The importance of church lighting is too often minimized by pastors, church boards and those who have to do with church management. Ordinarily business methods are just as important in the management of the church as they are in every-day mercantile pursuits, and in some respects they are more important because the objects to be attained are so much more vital to the entire community.

A pertinent expression of the situation in church lighting is contained in a booklet recently issued by the Philadelphia Electric Company in its campaign for this class of business. This booklet states that it is the function of those who manage church properties to see to it that attendance at church services shall reach a maximum and remain there, and yet it is surprising how little is done to make church edifices inviting and cheerful and comfortable. There is no single factor which will accomplish this result so surely and at such small initial expense as a scientifically designed system of electric lighting.

Interior of St. Edmunds Church, Oak Park, Ill., Showing Luminous-Bowl Units.

It is commonly known that any illumination which produces eye-strain or fatigue among the congregation is a positive force tending to reduce the interest of those who attend church services. Proprietors of places of amusement discovered this fact many years ago and now they look upon the use of electric light as a positive necessity. From every standpoint electricity is surely just as important in the church as it is in the place of amusement.

There is nothing in religion which teaches that those who attend church services should be made uncomfortable, and yet lack of forethought upon the part of those responsible too often makes attendance at church services a positive source of distress for those whose eyes are not strong or perhaps overstrained.

The principal reason for the use of electric light in churches is the ease of designing an installation which will not only give adequate and efficient illumination, but which will accomplish this result in a pleasing restful manner. The accompanying illustrations show a few of the effects that can be obtained with an electric installation. Direct, indirect and semi-indirect installations are reproduced and while the effects can only be appreciated by a personal inspection, some idea of the character of the installation can be obtained from the views.

In considering the quantitive values of the illumination in the church, experience has shown that it is inadvisable to stipulate a certain intensity of light for the auditorium, the sanctuary or chancel.

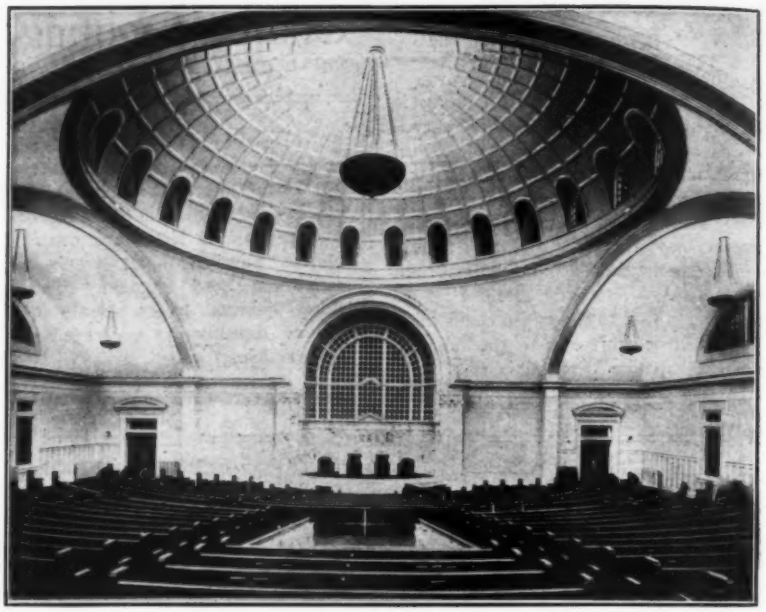
It is advisable, however, to determine a relative ratio between the intensity of light of the chancel, and the main part of the church. That ratio in a number of effectively illuminated churches is about 2 to 1 or greater in favor of the greater illumination in the chancel or sanctuary.

Owing to the general systems of control, particularly of electric lighting installations and the manipulation of this control, prior to the beginning of services one-half of the installation is usually in use. During the general service, in which the congregation takes part, the entire chancel and auditorium is illuminated. While the sermon is being delivered the illumination in the aditorium is usually reduced, and the chancel or such lamps that are used to illuminate the pastor and pulpit are used. The entire equipment is again used during the closing services. Provision should be made in Roman Catholic Churches for illumination of the stations of the cross throughout the day and evening.

Any set calculation relative to watts per square foot is inadvisable, owing to the numerous variables found in church structure. Some churches are illuminated with an energy consumption of 0.3 of a watt per square foot of floor area, while others have run as high as 2.5 watts per square foot, both installations being considered good examples.

There is, no doubt, greater intensity of illumination in the newer or reconstructed installations of churches; yet the variation in intensity of illumination is comparatively wide.

Commercial factors such as costs of installation and operation present themselves in all but a few instances, aand tend to determine the character and intensity of the installation to a great extent.



Totally Indirect Lighting in Eighth Church of Christ Scientist, Chicago.

A very elaborate lighting equipment can be designed, but unless the bearing of the commercial factors of the case has been determined, the chances are that the plan will be discarded.

In a paper recently presented before the Illuminating Engineering Society, Robert B. Ely gives some valuable data regarding various systems of lighting for churches. Direct lighting having been used to the greatest extent still predominates. This is largely due to the architects, as they are more familiar with this method of lighting. There is a tendency, however, in favor of indirect lighting, or a concealed direct lighting system.

The semi-indirect system has not been adopted to any extent, owing to the greater cost of translucent glass bowls, and the greater installation costs.

Direct lighting systems have been installed more generally, due to lower installation and operating costs, and the influence of the architect and the lack of information on the lighting matters by the general public.

It is not at all unusual to see new buildings and churches equipped in a manner at variance with good practice, simply because the architects plans were drawn and the client had entire confidence in the architect. Generally architects will co-operate with the illmuinating engineer but this is not always the case.

There are some general rules that should be followed, relative to the illumination of the church auditorium. No light sources should be within the line of vision.

All lamps in any system of illumination should be hung sufficiently high, so they will not obstruct the view from those in the gallery of the church. No fixtures should be located so as to obstruct the architectural features. The intrinsic brilliancy of all light sources should be reduced when visible from any point, by frosting or other diffusing media.

Hymn boards should be illuminated by a concealed source where the general illumination is low or otherwise.

Generally in the construction of the chancel one or more windows or sky lights are provided for daylight illumina-

Artistic Direct General Lighting, Unity Church, Oak Park.

Example of Cove Lighting. Exposed Lamps Used for Decorative Purposes.

tion of the chancel, thereby making this section of the church lighter by comparison than the main body of the church. With artificial illumination this effect may often be obtained more readily and more effectively.

In formulating a plan or method of lighting the chancel, or sanctuary, the construction of the interiors of the chancel will frequently demand special apparatus, reflectors and lamps, in order to obtain effective results. A chancel arch will greatly facilitate the installation of lamps and reflectors, but when there is no arch, it is more difficult to place the lamps and reflectors to direct the light to the best advantage and avoid sharp shadows. Such equipment when placed at a great height should be so arranged that it can be lowered for renewal and cleaning purposes. But owing to the installation costs lighting units are more often located in a permanent manner behind the arch and renewals are made by the use of extension ladders.

The use of decorative altar illumination is increasing. Electric imitation candles are being used in many churches. The lighting of tabernacle niches as well as the outlining of altars is being done quite successfully by the use of low-voltage lamps.

A sign-lighting transformer is often installed and receptacles provided at various points on the altar, together with the permanent equipment, so that small electric bulb signs and emblems may be readily connected. The cost of such an installation is more or less offset by the low operating costs of the equipment. For instance in a candelabrum there were 100 eight-candlepower 34-watt carbon lamps operating at a cost of about 34 cents an hour. They were not used, except for special services, on account of the cost of operation. By the installation of a sign-lighting low-voltage transformer and five-watt tungsten lamps the cost was reduced to about five cents per hour. This resulted in greater use of the equipment. Of course the illumination was reduced, but this was offset by the installation of two trough reflectors and tungsten lamps installed behind the sanctuary columns.

On account of the tendency in recent years to increase the illumination in the body of the church it is necessary to increase the illumination in the sanctuary to make a noticeable difference in the intensity of the light in the two sections of the church.

The depth of some of the chancels is fairly great and in order to increase the illumination on the altar or reredos it is necessary to concentrate the light from a source more or less localized.

Apparatus and Fixtures.

The use of dimmers in the church is becoming more general. In some cases they are placed on the chancel and imitation candle standard circuits in Episcopal churches, and when the choir procession takes place the lamps are gradually brought to full brilliancy as the choir enters the cancel. In some of the Catholic churches dimmers are connected to the circuits of the church auditorium and sanctuary for use during special services.

The question of appropriate fixtures is an important one. The fixture designer has been studying ornaments for years, and this knowledge of ornament is of equal importance to the illuminating engineer, as he is called upon, not only to plan the outlets for a lighting scheme, but he often is obliged to select the fixtures; in the case of some of the more novel schemes of illumination, he is obliged to design fixtures to meet unusual conditions. This means that he must be familiar with the fundamentals and the different orders of architectural design. The illuminating engineer must study harmony of design, and particularly the effect of light and shadow on architectural ornaments.

There have been many apparent reasons given for copying ancient lamps and light sources to carry out certain styles of architecture. In carrying out such designs of fixture and lighting units, the

Example of Direct General Illumination. All Lamps are Frosted.

units have frequently been so exposed and located in such a manner as to be distressing if not harmful to the eyes. Therefore, novel and unusual methods may be inaugurated in designing the illumination for the church with due regard for ritualistic symbolism.

When the illuminating engineer attempts to effect new and unusual methods of lighting churches he should of course be familiar with the orders of architecture, and ornament, so that he will be able to so design the lighting installation that some of the architectural features of the building may be brought out by light and shadow without distorting their appearance.

The candle is used in the services of the Roman Catholic, Episcopal (high), Lutheran and German Lutheran churches. It is given more prominence in the ceremonies of the Roman Catholic church than in the others.

In the Catholic churches the altar is the main feature to be considered for its symbolic significance, as the rubric of the church require the use of wax candles for their various services. However, in numerous instances some of the candles that are still in use can be replaced by either gas or electric imitation candles to greater advantage, and this will result in a more effective appearance.

The lighting specialist should know when and how candles are used in religious services, their advantages and disadvantages. The mellow glow of the candle with the low intrinsic brilliancy of its flame is pleasing aside from the flicker; although this probably is an open question as to whether the flickering of the candles for religious purposes is a distracting feature, or whether it is more effective that way. There are certain times, particularly on holy and feast days when the altar is illuminated to a greater extent than for ordinary services.

The candle has some disadvantages that cannot be overlooked, such as flicker, fire hazard, and labor required to maintain the proper appearance of the candle and fixture. Therefore, all candles that are used in addition to those required by the rubrics of the church may be replaced with electric imitation candles, or gas burners.

The lighting of the keyboard and pedals and interior of the organ frequently present some difficulty, owing to the location of the keyboard and the necessity for concealing the light source from the eyes of the congregation. Some lighting installations have been marred by the glare of an exposed light source supplying the illumination for the music rack and keyboard; also, by the lamps that are used to illuminate the choir when it is located in the front of the church.

It is customary to provide a portable lamp or extension bracket for the music rack connected to a live circuit to permit the organist to illuminate his music during his rehearsal on weekdays without using a number of lamps.

Illumination for the choir, when it is located in the gallery, can be provided by brackets or ornamental standards in direct lighting installations.

A lamp equipped with metal reflector located under the keyboard is frequently recommended for the illumination of the pedals.

Advertising and Exterior Illumination.

Church advertising is being indulged in. A number of churches now use the newspapers on Saturday of each week, and announce subjects, relative to church benefits and aims, that are to the interest of the community. This advanced step towards business management of the church has greatly assisted in the introduction of exterior illumination of the church and the adoption of the electric sign. Numerous churches have installed both illuminated and straight electric signs; some of these contain large numbers of lamps.

Greater attention should be paid by the manufacturer of electric signs to their designs. The sign should be of a design somewhat similar to the architecture, and could be improved by the use of Gothic or old English letters. The use of these letters in themselves would give to the sign a certain dignity that is not obtained by the block letters that are in general use. Although the legibility of the sign may be somewhat sacrificed, it would receive more favorable consideration from those interested in its introduction.

The illuminaed cross on the steeple of the church is very effective, and can be seen at a great distance. There is no doubt as to it being an advertiser of the church.

The use of lamp posts to improve the illumination of sidewalks about the exterior of the building tends to make the churches stand out to better advantage, and to encourage attendance, and adds to the safety of the pedestrians when the sidewalks are covered with snow or ice.

Some churches have bulletin boards that may be illuminated at night. Special features of this kind add to the commercial value of church lighting, because a bulletin board of this kind can be illuminated every night with very small expense to the church. The illumination of clock-dials is a feature that should not be overlooked, as this adds to the nightly use of light by the church, and acts as a constant reminder to those traveling the thoroughfare.

Entrance lighting is important, as it not only illuminates the stairway and the approach to the church, but indicates to the general public when illuminated that services are being held. This is being done by the use of ornamental brackets to a great extent, but more brilliantly by outlining of the arch over the entrance.

Direct Lighting Using Diffusing Bowls Except in Center.

Interior of St. James Church, Chicago, Major Portion of Light Comes from Concealed Lamps.

Commercial Practice
Management, Rates, New Business

CO-OPERATION BETWEEN ELECTRIC-VEHICLE MANUFACTURERS AND CENTRAL STATIONS.[1]

By E. L. Callahan.

From the viewpoint of the electric-vehicle manufacturer, the principal objects to be attained through co-operation are: the greater satisfaction among vehicle users, the reduction of their operating difficulties and the resulting increased sales; also the vehicle sales made possible by the good example established in the use of vehicles by the electric-service companies and because the service companies are in a position to advise the manufacturer of live prospects for the purchase of electric vehicles.

From the viewpoint of the electric-service company, the advantages to be realized are: The promotion of the sale of electricity, thereby increasing revenue; improved operating conditions; *i. e.*, through obtaining a considerable off-peak charging business the central-station load-factor is improved, and the cost of production reduced; advertising: the service company feels that every electrically operated machine, be it an automobile or a buzz-saw, is an advertisement instrumental in bringing new customers to its lines; furthering the interests of the industrial and social progress of the communities in which the central-station company operates, for any improvement in civic welfare is ultimately reflected to the service company either in improved surroundings and aesthetic betterment, or in good, round dollars.

These are the chief reasons for co-operation, I believe, and are worthy of consideration.

Fundamentally, there appears to be only one logical point of contact between the electric-service company and the electric-vehicle user, that is, the sale of current for charging. Is it not rather strange that the central-station companies are asked to render assistance in making the sale of a machine in which they are interested in only one item of its operation? The total annual cost of current for operating electric vehicles is seldom as high as 10 per cent of the total annual cost of owning and operating same. Can the central-station company, therefore, be expected to carry any great amount of the burden when it receives less than 10 per cent of the money spent by the customer? Do the gasoline manufacturers lend any material assistance in the sale of gasoline cars? The gasoline manufacturers receive a far larger part of their total revenue from automobiles than do the electric-service companies? However, the electric-service companies are vitally interested and will co-operate with the vehicle manufacturers, thereby doing their part in advancing the electric-vehicle business to the mutual advantage of all concerned.

From the customer's viewpoint, the most conspicuous advantages accruing from the use of electric vehicles are: the ease, convenience and graceful luxury of the pleasure vehicle; the low operating expense, increased radius of operation and general fool-proof construction of the truck, and of both the simplicity and freedom from breakdown, the absolute reliability and the avoidance of expensive attendance.

What can the service companies do to emphasize these characteristics or bring them more forcibly to the attention of the public?

First, by setting a good example. I understand that the Commonwealth Edison Company of Chicago has about 100 electric trucks and is greatly pleased, not only with their performance in delivering material and for general transportation purposes, but equally well with the advertising gained by their use.

It often occurs that, in buying automobiles for electric-service company use, the choice of cars is left to the discretion of the purchasing agent, superintendents, or men not directly interested in the development and increased output of the company. Therefore, in selling electrics to central-station companies, the salesman should go to the manager and to the commercial department and to the men who are interested in advancing the welfare of the company and the city—not alone to the prospective operatives of the machine, who, perhaps, are more interested in the joy rides they may be anticipating or the noise they may be able to make with an open exhaust in a gasoline car. From the viewpoint of a driver, an electric may have advantages over gasoline cars or over horse-drawn vehicles, or it may not, but from the viewpoint of the man selling electricity and responsible for the advancement of the use of electricity, there is no alternative but the electric vehicle within its proper sphere of proven usefulness.

Next, there is the consideration of cost of operation. A great deal of comment (to use a mild term) has been made relative to the failure on the part of electric-service companies to lower their rates for current to charge electric vehicles. It has been urged that the excellent character of this load and the assumed inexpensiveness of producing such service have been ignored. There are probably some service companies charging rates out of proportion to the cost of this service; however, these are among a fast declining minority, and they are gradually coming to a realization of the advantages of proper rates.

Let us see what advantages may be derived from lower rates for charging. I find that the cost of practically every other commodity incidental to the vehicle industry is increasing in price—and, as an example of this, I would mention gasoline—while the cost of electricity has been lowered, not slightly, but, in some cases, as much as 50 per cent. In arguing for lower rates, it is cited that the vehicle-charging load is an off-peak load, and so makes no demand upon the central-station's capacity. This is largely true and deserves careful consideration, but, on the other hand, the service company's investment is not only in generating equipment, but also in lines and transformers, and the amount of such investment is often about equally divided between the generating plant and distributing system, including transformers, meters, etc.

An electric garage requires just as much capacity in lines and transformers as any other load of similar size, and, in the case of private garages, the line requirements are often very much heavier than for other customers using a like quantity of current, notwithstanding the "off-peak" character of the load. Under such circumstances only a slight reduction in rates, if any, below those charged for other classes of service is justifiable.

A recent study of rates in a city of

[1] Paper presented before the annual convention of the Electric Vehicle Association of America.

325,000 inhabitants resulted in the establishment of a rate for charging of 3.8 cents per kilowatt-hour for the first 1,000 kilowatt-hours, and reduced thereafter for larger consumptions. But, after all, what inducement does reduction in rates hold out to vehicle users? From various sources, including the classic work of the Massachusetts Institute of Technology, the Report of the School of Mines of Columbia University, and others, it is found that the cost of current for charging is very seldom as high as 10 per cent of the total cost of operation, including proper interest and depreciation charges, and by proper depreciation charges I do not mean the exorbitant rates that may grow out of the mind of some warped economist, but the rates adopted by the most eminent authorities. The cost of current for charging being therefore less than 10 per cent of the total cost of average trucking work, a 20-per-cent reduction in the price of current would mean less than a two-per-cent reduction to the vehicle user in the cost of operation—truly an insignificant portion of the total annual expense.

It has often been suggested that electric-service companies should take an active part in the sale of electric vehicles, that they be displayed in showrooms, demonstrated by the selling force and advertised as are other current-consuming devices. It has often been suggested that central stations might well abandon the electric flatiron, with its "insignificant consumption" and turn their energies to the sale of electric vehicles, "using many times as much current." In discussion of this suggestion, I would say that the sale of a flatiron increases the company's annual revenue by almost three times the price of the iron, while the electric vehicle increase the annual gross by only about six per cent of the selling price of the vehicle; that is, a flatiron selling for $3.00 will produce an annual revenue of $8.00, while an electric truck selling for $3,000 results in an average annual revenue of only about $175. A flatiron produces a revenue equal to its original selling price in about 4.5 months, while an average electric truck requires about 17 years and a pleasure vehicle about 25 years.

Another excellent reason for the service company not going into the automobile-selling business is that it is too foreign to the business of the company, requiring a separate organization and, not naturally, falling, in any wise, within the scope of the service company's functions. It may often occur that the central station has a garage for its own machines and may find it expedient to care for a few other vehicles; in that case, if the business is found profitable and works no hardship upon independent garages, it is certainly a commendable plan, but such a garage might equally well have been established and operated by any other interest. Likewise, if the service company finds that it can sell machines as a profitable business and without interfering with its patrons, all well and good, but the central station should not be asked to sell or provide garage facilities for electric vehicles with the expectation of a profitable return from the increased electric revenue.

It has often been urged that service companies might do extensive advertising and sales work in co-operation with the electric vehicle manufacturers. A great many service companies are doing this on a large scale, but let us see how far they should go into this matter. A live central station interested in developing its business, to-day spends about 2.5 per cent of its gross revenue in soliciting and advertising, or, it is found to be necessary in getting business and in advertising, to spend about 25 cents for each dollar of increased annual revenue. On the same basis, the central station would be warranted in spending about $45 in obtaining an electric-vehicle customer. This includes the advertising and soliciting of unproductive prospects, as well as actual purchasers, and is based upon the revenue from a commercial vehicle. Considering the revenue from a pleasure vehicle, estimated at $80 per year, the permissible expense for advertising and soliciting becomes about $20. It is quite possible that when the desirable nature of this load is fully realized and the advertising incidental to the use of the electric vehicle and the general improvement in commercial and civic conditions is taken into consideration, that central-station companies might be warranted in spending as much as $60 for each commercial truck and $25 for each pleasure vehicle placed.

It should be remembered that part of this expense is necessary after the sale is made in arranging for contracts for service, purchase of charging equipment, etc. This probably seems like a small contribution when compared to the efforts made by the electric-vehicle manufacturers; but there is another side of this question. The actual amount of money which the electric-service company appears to be justified in spending would not be a fair measure of its efforts toward the larger sale of electric vehicles, for service companies have complete working organizations in close touch with every industry in their respective cities and are already doing business with practically every industry. The electric-service companies have the confidence of their customers, and their representatives are looked upon and referred to as authorities on related commercial and engineering questions. More, by far, can be accomplished in the advancement of the use of electric vehicles through these representatives than with the same expenditure of energy through any other channel available to the central station.

I will undertake to outline a plan of co-operation in the form of a few well-meant suggestions addressed to the vehicle manufacturers.

First. Do not waste your time in an effort to obtain a reduction in electric rates; the entire elimination of the cost of current for charging would result in a saving of only 10 per cent of the total expense of operation and ownership.

Second. Do not expect the central station to sell your cars for you, or to spend unreasonable sums of money in advertising electric vehicles. Do not urge the displacement of revenue producers that are, at present, many times more effective, to make room for electric vehicles.

Third. Do not expect the electric-service company to go into the garaging business for the purpose and with the expectation of obtaining the profit of the business from the sale of current.

To urge any of these measures will only waste your time and that of the central-station manager, and delay genuinely productive co-operative efforts.

In the foregoing, I do not want to be over-critical, but there has been so much unfounded criticism of the central stations because of their "failure to assist the electric-vehicle manufacturers," that I believe my statements have been warranted. I believe that many electric-service companies have been very slow to take up and push the sale of electric vehicles as it should be pushed, and that, thereby, they have failed to grasp an excellent opportunity to co-operate with you to mutual advancement. I now wish to offer a few suggestions, which, I trust, may lead to better co-operation and speedier recognition, on both sides, of the benefits to be derived therefrom.

First. There are about 1,500 copies of the Electrical Salesman's Handbook, published by the Commercial Section of the National Electrical Light Association (new sheets for which are issued quarterly) in the hands of as many central-station power and lighting solicitors, each daily calling on the manufacturing companies and other big industries in his city. This loose-leaf book contains accurate data on the consumption of current, and a description of the application of electric power to the various miscellaneous industries. The book is very instructive, highly esteemed and constantly referred to by both the solicitors and their prospective customers in determining the merits of electric power. Only a limited amount of data on the subject of electric vehicles is contained in the book at present. It should contain a great deal

more and of a very comprehensive nature. An immense quantity of such data is available, but has never been offered to the Commercial Section. The Commercial Section recommends, therefore, that the Electric Vehicle Association appoint a committee to collect the most reliable and dependable data available, showing the cost of operating electric vehicles in various classes of work, the saving and increased efficiency that may be effected, giving briefly the information required by a prospective customer in making an intelligent decision in solving his transportation problems. These data, if properly compiled, will be recommended for publication and distribution by the Commercial Section to its membership.

Second. Under present conditions, I believe you will agree with me that only a very small part of the advance information received by vehicle manufacturers concerning prospective purchasers of vehicles originates from central stations. The exact reverse should be true. I would recommend, therefore, that in approaching central-station companies the manufacturers urge that the central-station representatives—new-business men especially—be instructed to report all prospects which come to their attention. These men spend practically all their time among the very people that the manufacturer is trying to reach and should be able to render considerable assistance in giving advice to prospective vehicle purchasers.

Third. A great many electric-service companies credit their commercial men with contracts signed and so rate them for promotion, advances in salary, etc., and, in some cases, give them a monetary commission for such contracts. I do not, however, know of any company crediting its men with the placing of electric vehicles. In central-station work, the greatest credit is given the solicitor or salesman who displaces or prevents the installation of an isolated plant. Then why should not the salesman have credit for placing an electric vehicle, which surely displaces an isolated plant—a gasoline engine of from 20 to 75 horsepower capacity? I earnestly recommend that the central station be shown that just as much credit should be given for the placing of an electric vehicle as for a contract for any other power of similar character. True, the central-station company now gives its salesmen credit when a rectifier or charging equipment is contracted for, but it should be remembered that the revenue is not proportional to the number and capacity of rectifiers or charging equipments installed, but to the number of machines charged, whether they be charged in individual garages or all at one place. The giving of proper credit to salesmen by central stations for the sale of, or for being instrumental in the sale of, electric vehicles will be equivalent to the addition of several thousand vehicle salesmen to the forces now at work in the field.

Fourth. Wherever such a step is feasible, it should be recommended to central stations in the cities of medium and small size that an inspection department be maintained for the purpose of examining vehicles without cost to consumers and giving owners whatever technical advice they may desire. This cannot be made a general recommendation, because I do not believe that it applies to all central stations or communities.

Fifth. For the purpose of instructing and educating central-station employees in the construction and operation of electric vehicles and in the advantages to be derived from their use, that the manufacturers co-operate with the central stations by offering a brief course of instruction, preferably at the manufacturer's plant. This should compare, on a small scale, with the lecture courses now offered by the large manufacturers of electrical machinery. In many cases, it would be found more expedient to have the manufacturers' representatives co-operate in person with the sales department and central-station employees on the ground.

Large Manufacturer Boosts Central-Station Service.

The Charter Oak Stove & Range Company, of St. Louis, Mo., one of the largest manufacturers of stoves, ranges and furnaces in the country, recently sent to the Union Electric Light & Power Company the following letter which is indicative of the satisfaction and economy of central-station service in the Missouri metropolis:

"The Charter Oak Range & Stove Company prefers your service to the generation of its own power, chiefly for the following reasons:

"The supervision of a troublesome department is eliminated. The ease with which additions or subtractions from the power equipment are made without material increase in investment is most important to us. Under the old method, our greatest economy was to operate our plant to its fullest capacity.

"The addition of a machine which would require as little as 20 horsepower would under these circumstances compel a serious increase in our power equipment, while a corresponding decrease in the amount of power used would not save us anything at all.

"We are willing to pay for what we get, and we want exactly what we pay for."

This expression of appreciation, while referring of course to the Union Company's service, is nevertheless a boost to central-station service in general, and it is particularly significant in view of the size of the plant involved.

The Christmas Campaign.

One of the great opportunities of the business calendar and one that is frequently ignored by the central station is the Christmas season. The live merchants in every community appreciate its value and each year reap a neat profit while their less active fellow-merchants stand by and wonder why business is so dull.

Holiday trade has so many attractive features that it is a wonder that any company will let the season pass without an effort to catch some of it. Some dealers look forward to Christmas with pleasure and then let it pass with only a half-hearted attempt to get their share of the trade. The central station can well afford to center its attention on retail selling during December for business in other departments will be dull. The consumer is not buying wiring or fixtures if he can avoid it. Even the staples are sluggish. Everyone is laying aside money for holiday purchases.

A good Christmas trade means plenty of cash business at a time when collections are slow. As January brings unusual calls for money this feature alone should urge the dealer to try for the holiday trade.

The lines of competition change at this time. All wide-awake stores are bidding for business and a set of books or a piece of silver will make as good a present as an electric percolator. For this reason the central station should get a good start and have its missionary work done before actual buying begins.

The Christmas campaign should be carefully planned, opened with gusto and pursued with enthusiasm for the goal is a till full of shiny dollars. Money well spent at the opening will be returned with generous interest. The following notes are suggestions that should prove helpful at this time.

The points to be observed are few: judicious advertising; neat arrangement of stock; good show windows; and above all, intelligent salesmanship. The new-business manager should call a meeting of his force during the latter part of November and present the plan of campaign in detail at that time. One who has never tried it will be surprised at the interest the men will develop in work of this sort.

The first move is a good show window which should be ready December first. This is the most important window of the whole year and deserves careful study. It must be very attractive for the prospect's mind is plastic and now is the time to instill the thought that an electric present is superior to all others.

This window should be in the nature of a general exposition, calling

particular attention to the desirability of electric presents. Avoid all appearances of a bargain store nature. This window should be left two weeks, when one less artistic and making an imperative bid for business should be arranged and left for one week. The last three days demand another window in which price is the dominant feature. The late buyers are apt to be counting the price. This does not imply a cut-rate sale, but means to push the most practical articles.

Impress these ideas both in the show window and in advertising copy: electrical presents are intensely practical; they give a touch of luxury to a home; their constant use is a daily reminder of the donor; such a present is not likely to be duplicated as in the case of standard presents; both the retailer and the manufacturer stand back of the present with a positive guarantee; to sum up—electrical presents are practical, luxurious, thoughtful, original and reliable.

With this scheme at work in the window and in the newspapers, attention should be turned to the display room. The electric shop readily lends itself to decoration—novel effects can be arranged at slight expense. The manager should watch the large department stores and adapt their methods to his case wherever practicable. Each show case or display table should have the same attention that is given to the window. Properly displayed goods often sell themselves.

For example: devote a small table to chafing dishes, percolators and toasters; another to irons, water-heaters and bottle-warmers; another to utility motors; a fourth to toys and wireless apparatus; a fifth to devices for the motorist. Every company has in stock material for a dozen such displays.

Use card signs everywhere—notice how they are used in an up-to-date drug store. If these are printed on neat Christmas cards, their value will be doubled.

To compete with hardware stores, department stores, and jewelers, who are rivals at this season, the central station must cater to every desire of its customers. If he is prepared to insert a neat card in the package, wrap it with holly paper and ribbon, and deliver it without fail on Christmas Eve; there is little more that anyone can ask. The company can go a step further and insert its own card with this offer: If, for any reason, this article should not prove adaptable to your needs, return it to our store and full credit will be given toward any appliance in our stock.

With this preparation, the next step is a Christmas opening. The first four days of December are the best for this event. The opening should be given all the publicity possible. Urge people to come and look over the suggestions for practical presents. Get them into the display room. Keep it open evenings and make it attractive in every way.

The education of the salesman is something that many companies disregard. Not infrequently a customer will enter a store to look at goods and will listen attentively to the sales talk. If, on another occasion, a different salesman presents an entirely different and possibly contradictory talk, the sale is apt to be lost. The salesman should keep to a standard outline in demonstrating goods.

To insure intelligent salesmanship, call the men together from time to time and arrange the "points of attack." In the case of a new appliance, give the various points of beauty, utility and economy as if talking to a customer and then have all the salesmen handle the subject in the same way. This is particularly necessary during special seasons when new men who are not thoroughly familiar with the line are employed.

There is a large class of trade that might be termed "a two-dollar limit." One of this class wants a high-grade present and yet does not feel like paying over two dollars for it. This class outnumbers those who will buy expensive gifts and deserves careful consideration in any store. There is a tendency to display the very finest articles in the stock and keep the others out of sight. While most electrical appliances sell for over two dollars, any good stock will yield an attractive display of articles within this limit.

A phase of holiday business that is dormant is that of decorations. Here is a field that has never been properly developed. Churches, lodges, clubs, large stores—all are looking for new schemes of decoration and all are willing to spend liberally at this time. In addition to being attractive business, this trade brings the company in touch with prominent men associated with these organizations. It is the finest kind of publicity.

A similar opportunity is that of temporary signs. These can be built of rough lumber and wired with cleat receptacles. A canvass of the large stores during the latter part of November should produce some good business in this way. A good method of pricing such work is to charge labor, material that cannot be used again, and ten per cent of the value of all material that is returned in good condition. Once a business of this kind is established, it is an excellent outlet for supplies that have been slightly damaged and are consequently unsalable.

These suggestions are necessarily general in their nature. Local conditions everywhere will have their effect on holiday trade and each community offers its peculiar opportunities. To make the best of them requires careful planning and demands initiative and vigilance on the part of the man in charge.

Oklahoma Gas & Electric Company Helps in Water Famine.

During the long-continued drouth which prevailed in the South and West last summer, Oklahoma City for a time was practically without city water. When the situation became serious, the Oklahoma Gas & Electric Company volunteered to lay a temporary pipe line and install an electric transmission line to pump water from Northwest Lake, about four miles from the city, into the city water mains. The only return asked from the city was payment for the actual labor employed in construction and for reclamation of material used which could not afterward be used by the company at its full value. The company negotiated the loan of sufficient eight-inch pipe from the Oklahoma Natural Gas Company and had partially completed the line when heavy rains made further work unnecessary.

House-Wiring Campaign in St. Louis.

As a result of an aggressive house-wiring campaign the Union Electric Light & Power Company of St. Louis has secured over 5,000 new residence customers since January 1, 1913. Liberal use of newspaper space is attributed by the company as one of the most important factors in securing this business, also the company's policy of reducing rates to the lowest possible figure has placed electric service within the reach of practically every resident of the city. The monthly minimum charge for residences is now 50 cents.

Pittsburgh Section Dinner.

The monthly dinner of the Duquesne Light Company Section of the National Electric Light Association was held last week at the Colonial-Annex Hotel, Pittsburgh, Pa. About 320 members attended and were entertained by moving pictures depicting the last annual outing of the section at Homestead Park. Henry W. Pennywitt, local weather forecaster, addressed the members on the duties of the bureau and explained many of the delicate instruments which are a part of the equipment of the Weather Bureau.

Utility Development at Fargo, N. D.

When H. M. Byllesby & Company took over the gas and electric utilities of Fargo, N. D., in April, 1910, both properties were regarded as very well developed. In the succeeding three and one-half years, however, a remarkable gain in business has been accomplished, as the result of vigorous sales methods, extensions and improvements and reduced charges for gas and electric service.

Consumption of gas per meter has increased 72 per cent; of electricity per meter, 10 per cent. Street-railway traffic has increased 50 per cent, the railway having been acquired in 1910, and with the other properties made subsidiaries of the Northern States Power Company. In the three and one-half years period gas output increased 123 per cent, or to 2,250,000 cubic feet per week, and electric output 65 per cent, or to 95,000 kilowatt-hours per week. Meanwhile the population of the city gained about 1,000, or 8 per cent. There are 623 more gas customers and 991 more gas ranges than when Byllesby & Company took hold; 1,154 more electrical customers, with an increase of 1,470 kilowatts in lighting and 851 horsepower in motors connected. It has been necessary to erect a new 400,000 cubic foot gas holder, add to the gas and electrical manufacturing capacity, and build nine miles of new pole lines, 10 miles of gas mains and 3.5 miles of street railway; the latter to the industrial suburb of Dilworth. There is now one electric meter for every five people and one gas meter for every six inhabitants in Fargo.

Unique Demonstration of Hylo Lamps.

To demonstrate the merits of the Hylo lamp, the United Electric Light Company, of Springfield, Mass., is giving "a domestic drama in four acts," in the miniature "Hylo Theater" which has been erected in the rotunda of the company's office. The actors are dolls about a foot high and the four scenes show, first, a bedroom where the light is a terror to would-be burglars; second, a bathroom where the light is a safeguard against falls; third, a sickroom, where its convenience to the nurse is demonstrated; and fourth, a reception room, where the miniature hostess entertains her admiring callers. The scenes change in a second of two during the time that the curtain is down.

The novel display attracts a large number of people, and the advertisements in the local newspapers particularly invite the children, which, of course, insures the interest of the elders.

House-Wiring Rates in Muncie, Ind.

Through the influence of the Muncie (Ind.) Electric Company, the local electrical contractors have agreed upon the following house-wiring rates, for old buildings, in all cases where the contract for the job has been secured by the electric company. The prices given are for open and concealed wiring:

	Open	Concealed
3 Outlets	$ 4.50	$ 9.00
4 Outlets	5.85	10.65
5 Outlets	7.00	12.25
6 Outlets	8.25	13.80
7 Outlets	9.50	14.35
8 Outlets	10.75	15.90
9 Outlets	12.00	17.45

A charge of $1.10 is made for each additional outlet, open, and $1.50 for each additional outlet in excess of 9, where concealed wiring is employed. Switches, fixtures, lamps, etc., are charged for on a similar uniform scale which has been approved by all the local contractors involved.

New Sign Ordinance in Ft. Wayne.

A new sign ordinance in Ft. Wayne, Ind., stipulates that nothing but electric signs shall be erected along the main thoroughfares. Such electrically illuminated signs must not be transparent, and they must have a minimum illumination of two candlepower per square foot of area. The latter clauses are added in order that the outline sign may be useful in reflecting light to the street. The candlepower per unit area is specified so that a merchant may not erect a large canvas with a small lamp in the corner and call it an electric sign. Several attractive signs have recently been added to the circuits of the Ft. Wayne & Northern Indiana Traction Company.

An Electric Calendar.

An electric calendar consisting of a card 4.5 by 11 inches in size for each month, all tied together with a pretty white silk cord, has been prepared by Miss Grace T. Hadley, 350 North Clark Street, Chicago, Ill., for the special use of central stations who wish to send some souvenir of the kind to their patrons at the Christmas holidays. The calendar is tastefully gotten up, and illustrated in colors with applications of electric devices. It is also suitable for general use.

Owensboro Exposition.

A "Made-in-Owensboro" exposition was held in that Kentucky city last week, the Kentucky Public Service Company, which owns the central station there, having an exhibit of appliances. The Robertson Electrical Company had a display of nickel-plating and polishing by electricity, and the Kentucky Electrical Company, manufacturing electrical supplies, displayed its motors, lamps, etc.

Sign Manufacturers Organize.

An announcement has been made of the organization of the National Association of Electric Sign Manufacturers. The membership includes manufacturers of electric signs and illuminated advertising displays in Class A; and manufacturers of electric sign materials and accessories in Class B.

Such an association has been agitated for a long time and the need is plainly set forth in the objects of the Association, which are as follows:

(1) To combat hostile sign legislation, local and general; to change unfair and restricted city ordinances pertaining to electric signs; and to oppose taxes and licenses on signs.

(2) To disseminate a knowledge of the benefits of electrical advertising. (This will be accomplished by means of advertisements, photos, and write-ups in the popular magazines, trade papers, and through the press associations.)

(3) To generally promote the welfare of its members.

(4) To maintain a bureau in charge of the secretary which shall guard members of the Association against employing agents or salesmen who have proved dishonest with other companies.

(5) To establish an Association standard for high quality of material, workmanship and design and to impress on the public the merit of "Association standard" goods.

(6) To combat the growing evil of stealing sketches and matching prices.

Individuals and firms interested in affiliating with the National Association of Electric Sign Manufacturers should address the secretary, Lloyd E. Brown, 315 South Warren Street, Syracuse, N. Y., for membership application blanks.

Slogan Signs for Rochester.

The slogan of the Rochester (N. Y.) Chamber of Commerce—"Here Quality Predominates"—has been crystallized into duplicate electric signs, one of which has been placed at the eastern entrance to the city, the other at the western entrance.

The Manufacturers' Trade Committee recommended the installation of these signs to the Chamber of Commerce, and the money to cover costs—a little over $3,000—was raised by subscriptions of $10 each.

The signs are 50 feet high and 32 feet wide, the letters being of the 30-inch grooved type with a grooved border around the entire sign. Each sign contains 585 10-watt lamps and nine 100-watt lamps. The Rochester Railway & Light Company is to maintain and operate the signs for a period of five years without charge.

Electrical Construction

THE ELECTRICAL WORK IN A MODERN THEATER.

A Description of the Installation in the New La Salle Opera House, in Chicago.

The success of the modern theater is very largely dependent upon the sort of lighting effects employed. However elaborate the stage setting and however clever the performance, the failure to supply the proper sort of illumination, and to supply it promptly whenever it is needed, is very liable to prove disastrous to the play. This is especially true of plays of the musical-comedy type.

In order to insure the proper sort of installation in a theater a great deal more than a knowledge of electrical construction and familiarity with the principles of illumination is required of the designer. He has to be a specialist on theater work, and the more intimate his knowledge of the requirements of the sort of play to be staged the easier it is for him to lay out the best design of electrical equipment. The installation described in this article was designed by a man who, as electrician and mechanical director for the company owning the theater, has devoted his entire attention to show-house work for a number of years, and so has acquired an unusual familiarity with the needs of the sort of play that his company produces. The theater in question is the La Salle Opera House, a Chicago play house that caters to the best patronage of high-class musical comedy. During the past summer this theater was completely remodeled and the equipment with which these notes are concerned was put in them.

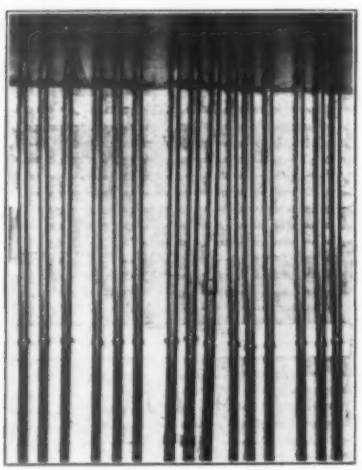


Fig. 1.—Conduits Entering Bottom of Pull-Box Located on Switchboard Platform.

The Service That Had To Be Provided For.

The La Salle Opera House has a seating capacity of 800, and this is divided between the main floor and one balcony. The area of the main floor is about 4,800 square feet. Along its front edge the stage is 30 feet wide; its depth is 21 feet. There are dressing rooms for about 75 people, and the usual number of shops, workrooms, and the like. There is an automatic motor-operated system for fire protection, and also a ventilating plant which includes motor-driven fans and electrically operated apparatus for cleaning the air supplied the house. In the design of the electrical work, therefore, the problem was to provide for the correct lighting of the areas mentioned, to install the proper motor circuits, to arrange the lighting circuits so as to secure the greatest possible flexibility of the control, and to make sure that the whole installation would be free from the fire hazard.

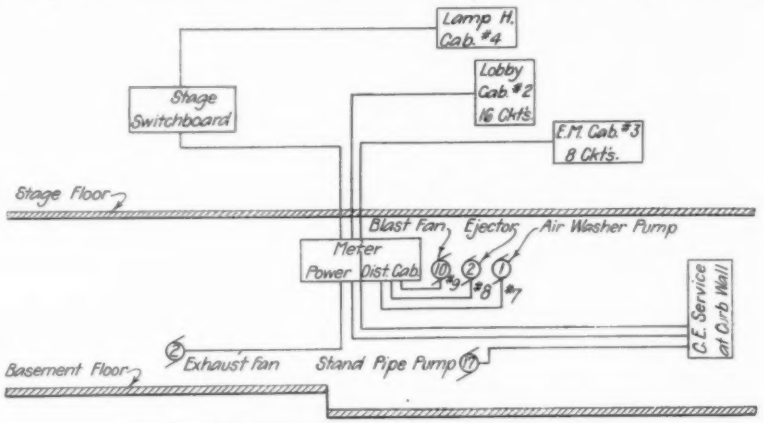


Fig. 2.—Arrangement of Cabinets and Principal Feeders.

Since the main subject of this article is wiring rather than lighting, little need be said concerning the sort of lighting that was required in the auditorium further than that the fixtures were to be of an artistic but rather simple design, and that the illumination had to be free from glare and to be uniform and pleasing. In compliance with a city ordinance, there was

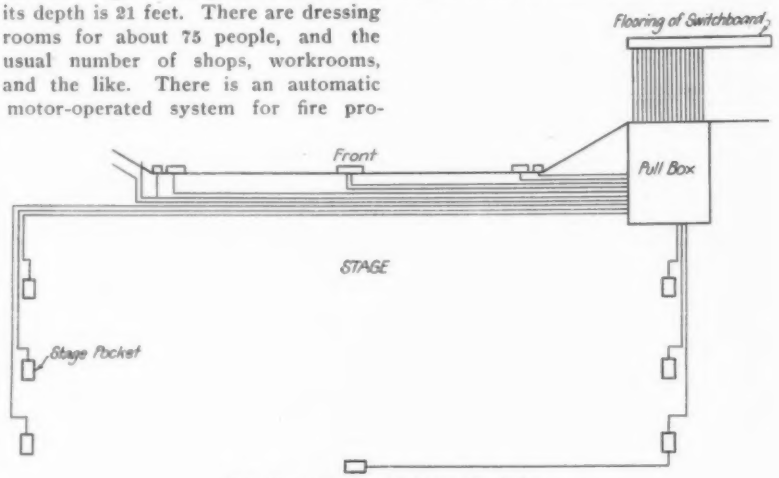


Fig. 3.—Location of Stage Pockets.

necessary the equivalent of one 16-candlepower lamp for each 400 square feet of floor which could be kept burning throughout every performance.

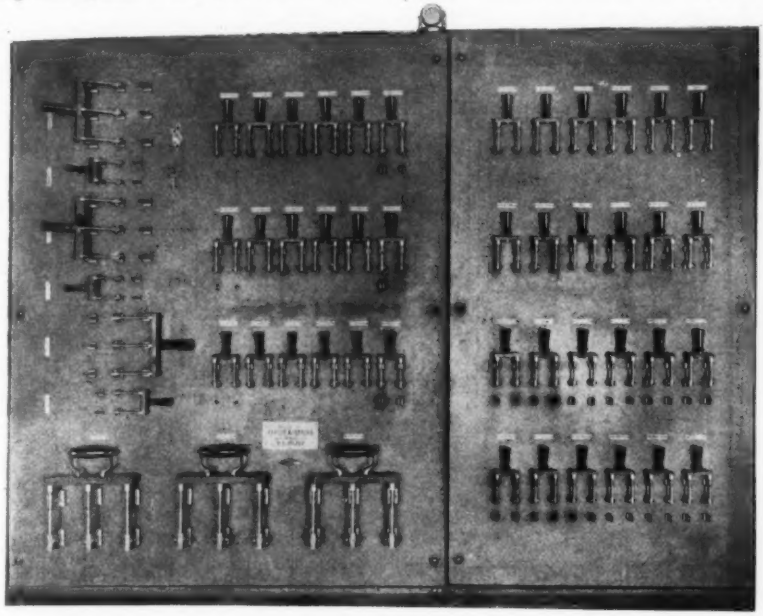


Fig. 4.—Front View of Stage Switchboard.

Important facts concerning the stage illumination will appear incidentally later on in the discussion.

All permanent circuits had to be run in conduits, of course, this being a requirement of the National Electrical Code.

ment of distributing centers in the theater. At the curb wall in the street —see right-hand side of figure—three separate electric services are tapped off from the underground mains of the Commonwealth Edison Company and carried into the basement. One of these services goes straight through to the fire-pump motor—see 17 in Fig. 2—without switch or fuse, and another runs directly to the cabinet controlling the emergency lights, which is called Cabinet No. 3 and is located in the lobby. In the figure this feeder is shown broken at the meter cabinet; but actually there is no interruption at all between the street and Cabinet No. 3. There are no fuses or switches between the fire-pump motor and that one of the Edison Company's substations to which the theater is connected. There are 72 emergency lights.

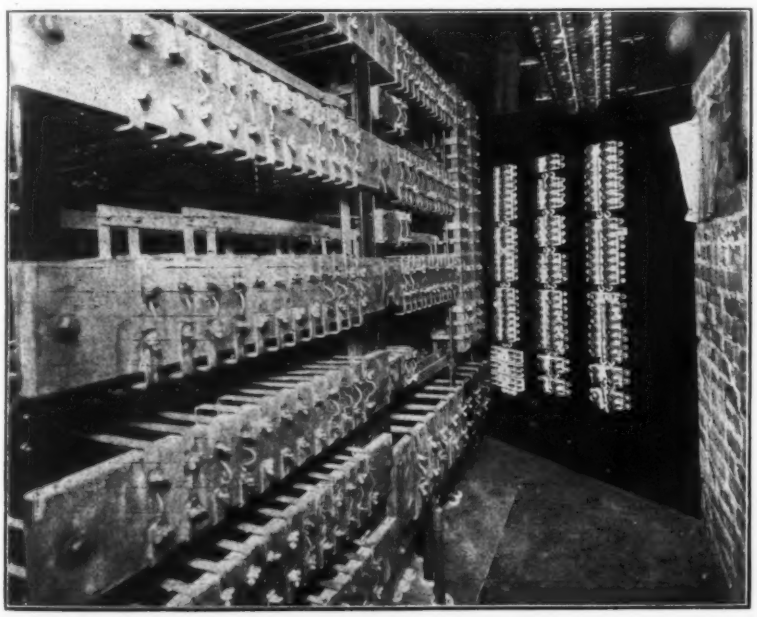


Fig. 5.—View of Part of Space Behind Stage Switchboard, Showing Busbars, Pull-Boxes, Etc.

Arrangement of Circuits.

Fig. 2 shows the principal feeders, the motor connections and the arrange-

The main house service passes through the meter cabinet and then to the stage switchboard. It is fused in the service cabinet, and a switch is supplied there. The lights in the theater lobby are controlled from Cabinet No. 2, and three No. 6 conductors connect this cabinet with the meter cabinet, Cabinet No. 2 being located in the box office. This circuit is fused in the meter cabinet.

There are six No. 6 wires in the two three-wire feeders between the stage switchboard and Cabinet No. 4, which cabinet is located in the operating booth in the rear of the balcony and serves as the distributing center for the spot lights and picture machines. It is understood, of course, that these feeders are fused on the stage switchboard, and that in Cabinets No. 2, No. 3, and No. 4 all branch circuits are properly fused.

Control of the lighting used in cleaning the house is effected by means of lock switches conveniently located, and the women who do the cleaning carry the keys to these. Instead of using lamps on portable stands, as is common practice, part of the lamps employed in the regular illumination of the house are used in cleaning, these particular lamps being connected to the lock switches. This scheme was adopted because of trouble that the designer of the electrical work had previously experienced from employees breaking portable lamps by rough and careless handling.

In every dressing room there is a ceiling light which is used by the cleaners, and these lamps are on two three-way switches conveniently located. The regular dressing-room lamps are controlled entirely from the stage switchboard, and are not turned on until the players are ready to begin making up for a performance.

Fig. 3 indicates the layout of a part of the conduit work and shows the arrangement of the stage pockets. The location of the pockets is to be noted especially here, for in theater work mistakes in the location of these are quite common. For example, pockets are sometimes put so near the middle of the stage that they will usually be found covered up with some of the paraphernalia of the show when the electrician tries to get to one of them during a performance. When, on the other hand, they are put too near the side walls of the stage they are quite

liable to be kept covered most of the time with scenery that happens to be temporarily not in use.

It will be noted that there are seven stage pockets in the La Salle Opera House stage. Each one of these has one receptacle for plugging in an arc lamp and three receptacles for plugging in incandescent lamps, the arrangement being such, of course, that it is impossible to plug an arc on an incandescent circuit or the reverse.

Before dismissing this part of the discussion it is well to point out that the arrangement is such that part of the border lights can be used to illuminate the stage sufficiently for any purpose except a regular performance. Reference will be made to the border lights later on.

A study of Figs. 4 and 6 will give the reader an idea of the sort of lamp control provided for on the stage switchboard. Anything like a complete enumeration of all the different connections of circuits that can be readily secured by the proper manipulation of the switches on this board would require more space than the subject warrants. In fact such extensive enumeration is probably not necessary; by reference to the table of symbols (Fig. 7) the reader can trace out the various combinations of circuits for himself. However, in order to make this task easier attention is here called to a few of the possible combinations.

The three short vertical lines terminating in arrows near the word *Arc* in Fig. 6 represent wires from the service cabinet located where the circuits enter the building. It will be noted that these connect to busbars that extend to the right and to the left-hand sides of the switchboard. It will be noted further that three three-pole switches at the bottom of Panel No. 1 provide for connecting the house, the arc and the stage lights, respectively, to these busbars. All the house lights can be extinguished simultaneously by opening the proper one of these three switches; or, with this switch closed, the house lights can be pulled off in sections by opening the double pole switches at the upper left hand corner of Fig. 6, where the arrow heads indicate circuits from the switches to the lamps. Pulling the house lights off does not interfere with the dressing-room lights or any other lights in the building. The orchestra lights—connected to the circuit marked *O* in Fig. 6—can be left burning while both house and stage lights are out, it only being necessary to throw the orchestra switch downward when the main stage switch is opened. Likewise with the other lights an apparatus connected to the switches in this row and the one immediately above it.

It is well to note at this point that three colors—white, red and blue—are used in the footlights and also in the border lights, which latter are employed to illuminate decorative curtains or borders suspended above the stage and toward the back of it, the lamps themselves being installed in metal troughs hanging in front of the borders they are designed to light. Fig. 6 makes it clear that footlights of any one of the three colors can be controlled with the large three-pole stage switch at the bottom of Panel No. 1, or that these lights can be left burning when this switch is opened. Consider, for example, the white footlights, which are connected to the double-pole, double-throw switch marked *WF* in the upper right-hand corner of Fig. 6. When this switch is thrown to the right the white footlights burn independent of the position of the main stage switch. Likewise for the border lights and the other lights connected to Panel No. 1. For example, the white borders can be shifted at will to the stage switch or thrown on the busbars that are connected directly to the house service switch by throwing the switch *WM* to the left or to the right. The stage-pocket circuits, which are marked *SP* in Fig. 6, can be controlled by means of the vertical row of double-throw switches on Panel No. 1 or independ-

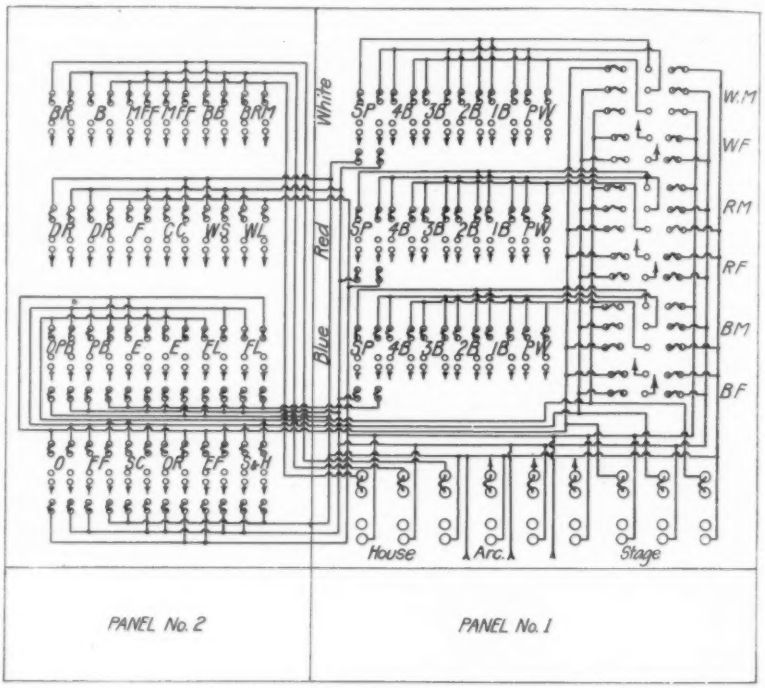


Fig. 6.—Diagram of Wiring on Stage Switchboard—Wiring Viewed from Rear of Board.

SWITCHBOARD SYMBOLS

Symbol	Circuit	Symbol	Circuit
BR.	Balcony Rail	4B	4th. Border
B	Boxes	3B	3rd. Border
MFF	Main Floor Fixtures	2B	2nd. Border
BB	Balcony Bowl	1B	1st. Border
BRM	Balcony Rims	PW	Proscenium Wall
OPB	OP Bridge	WM	White Main
PB	P Bridge	WF	White Foot Lights
E	Extra	RM	Red Main
FL	Front Lights	RF	Red Foot Lights
O	Orchestra	BM	Blue Main
FF	Fly Floor	BF	Blue Foot Lights
SC	Stage Chandelier	DR	Dressing Room
OR	Operating Room	F	Fans
EF	Exhaust Fans	WS	Work Strip
S&H	Shops and Halls	WL	Work Lights
SP	Stage Pockets	CC	Constant Circuit

Fig. 7.—Table of Symbols Employed in Switchboard Diagram.

ently of them, as may be desired, a second set of double-throw switches being provided on the panel to make this possible.

Examination of the diagram will make it clear that stage pockets can be kept alive without keeping current on any other lamp circuit connected to the switchboard. In a play now going on at the theater in question this proves very convenient when singers not in sight of the audience have to read their music while the stage is in darkness. Many other convenient combinations not mentioned here will be appreciated by any reader who is a practical theater electrician.

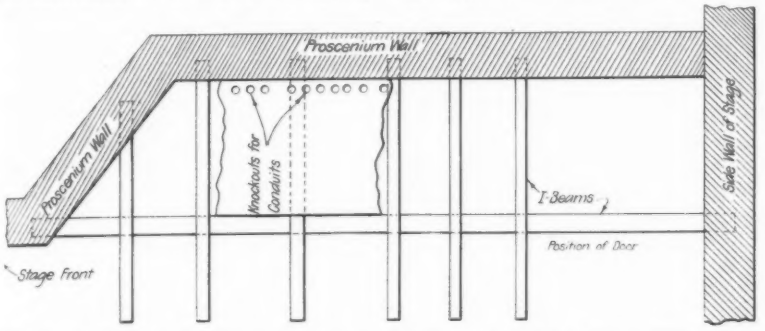


Fig. 8.—Framework of Platform on Which Stage Switchboard is Built, with Part of Bottom of Pull-Box Shown.

Some Details of Construction.

Switchboard Construction.—If it is properly built the switchboard in a theater is one of the most interesting parts of the equipment from a mechanical point of view, as well as from the standpoint of convenience and adaptability in an electrical way. The switchboard in the La Salle Opera House is located on a platform built behind the proscenium wall, this platform being 8 feet above the stage and near the forward right-hand corner of it, as one stands on the stage and looks toward the auditorium. Fig. 8 is a sketch of the framework of the platform. A substantial I-beam extends across from the stage wall at one end to the proscenium wall at the other and its ends are buried in these walls for support. Lighter I-beams are laid transversely on top of this, one end of each of these short beams being supported in the proscenium wall. On these beams what may be called the floor around the switchboard is built. In the front of the board the floor is of concrete; behind the board it consists of the top of a pull-box extending back to the proscenium wall. The box is made of No. 12 gauge sheet steel, is 15 inches deep and forms the compartment through which the circuit is brought from the meter cabinet to the switchboard and through which the wires of a number of branch circuits run. The conduits enter the bottom of this large box through knockout openings—see Fig. 8—and are fastened in place with locknuts and bushings, in the standard way. The wires pass out of the box to the switchboard through porcelain bushings, as shown at the bottom of Fig. 5, the bushings used being of the Federal type, bushings of which type are held in place by a shoulder that fits against one side of the wall of the pull-box and a clamping ring that screws up against the wall on the other side. It should be explained, in passing, that throughout the installation under consideration wherever wires not in conduits pass through the walls of metal boxes these bushings are employed for protection of the insulation.

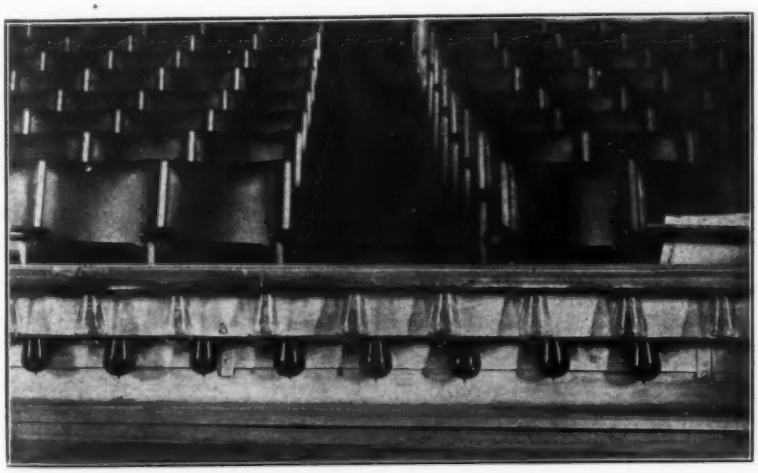


Fig. 9.—A Section of the Footlights.

The wires in the pull-box just mentioned are made accessible by means of a hinged door in the top of it, which opens upward, of course. Parallel with this box, and six feet above it, a second pull-box extends from the top of the stage switchboard back to the proscenium wall. The inside of this is reached through a hinged door opening downward, a part of which door, with porcelain plug-fuse bases installed on it, is shown at the top of Fig. 5. Above this box the theater dimmers, furnished by the Cutler-Hammer Manufacturing Company, are installed.

Between the end of the switchboard and the proscenium wall at one side, and the end of the board and the wall of the stage at the other, the space is closed by sheet-steel walls which extend from the switchboard platform up to the pull-box at the top. Thus the space behind the board, which is shown in Fig. 5, is formed into a fireproof compartment, which is entered through a door at one side, the door being provided with strong spring hinges which normally keep it closed.

A construction feature that is an especially interesting part of the switchboard work is the scheme employed here for taking care of branch-circuit fuses. Besides the two pull-boxes already described, there is one at the end of the space behind the switchboard next to the stage opening. On this (see Fig. 5) and on the lower surface of the top pull-box the fuse bases are mounted. They are held firmly in place with machine screws turned into tapped holes in the metal, and each wire is brought out through a separate hole provided with a porcelain bushing clamped in as already explained.

Copper-tipped link fuses are employed on the back of the switchboard, and they are held under wing nuts, so that metal tools are not needed in replacing blown fuses. This is a detail of no mean importance; for a pair of pliers or a screwdriver and a nervous attendant make a bad combination behind the switchboard during a theatrical performance. The neutral of the three-wire circuit is not fused.

The link fuses are mounted on slate bases installed on an angle-iron framework; the construction is clearly shown in Fig. 5. It is 12 inches from the switchboard to the fuse bases, and 30 inches from these bases to the wall.

Note that all busbar work is protected by being located between the switchboard and the fuse bases.

Construction of Footlights. — The length of the footlight trough has been given: it is 30 feet. There are 48 white lights, and equal numbers of the red and the blue. Standard-base tungsten lamps of the 40-watt size are used. Fig. 9 shows a part of the footlights as they appear to an observer looking from the stage toward the auditorium. It will be noted that the lamps are never visible at all to any part of the audience, and that they are installed in the reverse position from

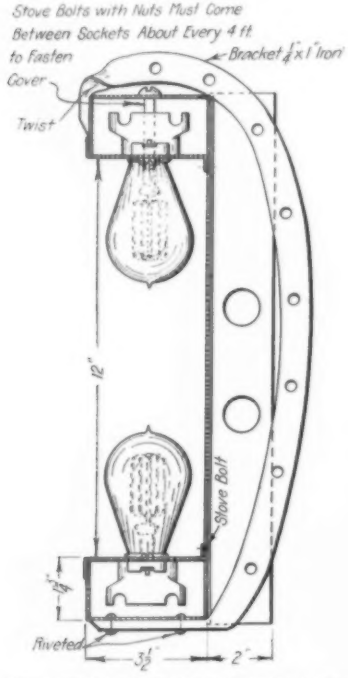


Fig. 10.—Cross-Section of Border-Light Fixture.

that occupied by the lamps in the older style of footlight. The sockets for the red lamps are to be distributed in the lower row of lamps, but the red lamps had not been installed when the photograph was taken. Fig. 11 makes the construction of the footlight trough rather clear. The lamps are installed in Pass & Seymour No. 61777 sockets. Only the outer portion of the socket is shown in Fig. 11; most of it is inclosed in the wiring space formed by the curved metal surface and the metal plates in which the lamps are shown set. The curved trough is made in sections of convenient length and where the ends of two adjacent sections meet the curved metal plates rest on a piece of strap iron which is bolted to the main body of the footlight trough at some such point as that marked *a* in Fig. 11. In the figure the light line inside the curved surface is meant to indicate the position of the piece of strap iron. By the removal of the bolts at *c* and *e* and the corresponding bolts at the other end of the section, this section of the metal can be taken off and the wiring and sockets thus made accessible. The wires are carried into the wiring space provided for the lamps at one end of the stage, through a bushed hole of the proper dimensions. The surfaces from which light should be reflected are painted so as to produce an even, uniform reflection, while that side of the trough which is in view of the audience is gilded so that it presents a pleasing appearance, there being an extra strip of metal to cover the line between the removable and the fixed parts.

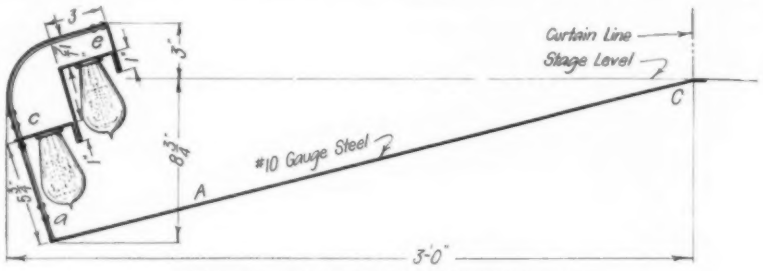


Fig. 11.—Cross-Section of Footlight Trough.

The portion of the footlight trough between *A* and *C* (Fig. 11) is not arranged with a view to making it a reflector; it has a dull finish. The aim is to protect people in the theater from the annoying glare that reflection from this surface might produce.

The Border Lights.—The purpose of the so-called border lights in stage illumination has already been referred to. Fig. 10 indicates the construction of the border-light fixture used in the theater under consideration. This fixture, which may be termed a trough, is made of No. 20 gauge galvanized iron, and the sockets, which are of the same type as those used in the footlights, are installed in iron boxes that extend from one end of the fixture to the other, along opposite sides of it. The fixtures are from 26 to 32 feet long, and, counting the one used to light up the drop at the back of the stage, there are four of them. Being suspended from the ends of counterweighted steel cables, the fixtures can be raised and lowered at will. Flexible conductors, in which all connections are soldered, supply current to the lamps.

Dressing-Room Wiring.—Except that the mirrors were removed from between the lamps before the photograph was taken, Fig. 12 shows a dressing room in the condition typical of the room in the average theater. The danger of fire here is not so great, though, as one might suppose. Ceil-

Fig. 12.—Interior of a Dressing Room.

ings, walls and floors ase composed either of iron or of concrete, and it is required that when inflammable fabrics are left they be hung under a non-combustible covering. However, the chorus girl finds exposed lamp bulbs convenient places to leave handkerchiefs, and similar articles that have just been washed, to dry, while attempts to heat a curling iron by inserting it in the receptacle from which a lamp has been removed are not exceptional. These and other equally foolish performances leave but one course to be pursued, and that is to make the circuits and the lights as nearly foolproof as they can conveniently be made. This is what has been done in the La Salle Opera House. As the figure just referred to shows, no drop lamps are used here; and all lamps are equipped with guards of such a sort that they cannot be removed without the use of a good strong screwdriver. The lamps are installed in Russell outlet-box receptacles set in Sprague 8B outlet boxes, and Crescent guards are used. The guard is held in place by the same screws that hold the cover on the outlet box.

In the dressing room shown in the figure, a mirror is always kept in place between each two of the five lamps in the horizontal row. Note that with this arrangement four persons can use five lamps, and, at the same time, have a light on each side of the mirror, so that the entire face can be satisfactorily seen during a make-up.

A make-up put on by the light of a carbon-filament lamp is liable to be anything but pleasing to an audience that views it across tungsten footlights, on account of color difference. Hence tungsten lamps are used in all the dressing rooms at the La Salle Opera House.

Other Notes on Installation.

Reference has been made already to the ventilating and fire-protection systems in the La Salle Opera House. The motors for these systems are 220-volt direct-current machines, and are equipped with Cutler-Hammer starting devices, the fire-pump motor being arranged for automatic starting, as noted above. In the motor circuits and throughout the building General Electric Red Core wire is used. The General Electric Company also supplied the stage pockets.

The stage switchboard was built by Kohler Brothers, of Chicago, according to plans drawn by Roscoe E. Major, mechanical director of the La Salle Opera Company, who designed and directed the installation of all the electrical work. The Alliance Electric Company, of Chicago, was the electrical contractor.

There are eighteen 100-step Cutler-Hammer theater dimmers in the installation, which are mounted in a straight row across the top of the switchboard. Nine of these have the new double-sided plates. Any stage circuit can be dimmed.

In conclusion, the writer wishes to acknowledge the kindness of Mr. Major in supplying such data as he had to be called upon for in the preparation of this paper.

E. S. Cowie.

People who attend the annual conventions of the National Electrical Contractors' Association know the gentleman whose photograph appears in this column; for since he became a member of the association, ten years ago, he has been attending all its conventions and has been an active, influential participant in the discussion of matters that have come before these meetings. He is a prominent electrical contractor of Kansas City, Mo., whose headquarters are at 1517 Grand Avenue.

E. S. Cowie, Director of the National Electrical Contractors' Association.

Mr. Cowie was born in 1878, in Kansas City, where he has always lived. He has been in electrical work there continuously since 1896. His first position was with a small concern known as the American Phonograph Company, and his work with this concern consisted mainly in the repair and maintenance of storage batteries. In 1898 he began working for himself as an electrical contractor, undertaking at first only the small jobs that his limited resources and experience warranted his attempting. He has continued in electrical contracting and allied lines with a constantly increasing measure of success. Storage-battery work has always been a specialty of his, and so he has made the maintenance of the battery equipment of electric vehicles a prominent and important branch of his business. The rear half of the first floor of the large building he is now using for his store and shop is specially fitted up for bringing in electric vehicles and overhauling and repairing the batteries on them. Mr. Cowie also does an extensive business in the way of generator and motor repairing. While he does much electric wiring, he does not bid for jobs that are let at figures so low as to leave the contractor no profit. Nor does he push the fixture business strongly; this is a thing that he feels that the fixture houses themselves can best take care of.

Mr. Cowie's connection with the National Electrical Contractors' Association has been referred to; it should have been stated also that he is one of the directors of that organization. He is prominent, too, in the Missouri Association of Electrical Contractors, and was one of the organizers of the Kansas City Association, of which body he served as president for three years, being the first president. He is a man who believes in co-operative effort among electrical men, and who seems to show his faith by his works.

Among the Contractors.

The Beaver Engineering Company, Newark, N. J., has been awarded a contract for electrical work in the new addition to School No. 2, Broadway and Twenty-sixth Street, Bayonne, N. J.

Electrical contractors of Perth Amboy, N. J., have organized the Electrical Contractors Association of Perth Amboy, for the improvement of their business, exchange of ideas, and general promotion work. The association will meet on the second Monday night of each month. The following permanent officers have been chosen: president, Harvey Clark, of Clark & Schuck; vice-president, M. J. Dahl, of the Guth Electrical Company; secretary and treasurer, Victor P. Christofferson.

The Kingsbury Electric Company, of Baltimore, has been awarded the contracts for illuminating the St. Paul and Calvert Street Boulevard. The same firm has also been awarded the contract for the Washington Street school at Frederick, Md., and the National Bank of Frederick.

NePage, McKenny & Company have been awarded the contract for the complete electrical installation of the new Union Passenger Depot being constructed in Spokane, Wash., by the Oregon & Washington Railroad & Navigation Company. This is one of the finest passenger stations in the Northwest and will be equipped with all the latest electrical innovations. This firm has also been awarded the contract for the electrical work in the residence of C. D. Stimson at the Highlands, Seattle. This is a very complete residential installation, the electrical work costing $3,000.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, president, 59 Deerfield Street, Hartford, Conn.
H. S. WYNKOOP, vice-president, 13 Park Row, New York, N. Y.
WILLIAM LINCOLN SMITH, secretary and treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association, 11 Wareham Street, Boston, Mass.
J. E. LATTA, assistant secretary, 606 South Dearborn Street, Chicago, Ill.

Executive Committee

EUGENE N. DAVIS, chairman, Brookline, Mass.

Frank R. Daniel, R. P. Strong, Henry A. Knight, C. H. Fletcher
Washington Devereux, James H. McCarthy, James H. Fenton
R. J. Forsyth, C. W. Mitchell, A. W. Hopkins, G. W. Perry
George L. Collison, T. H. Fritts, A. H. Soper
T. W. Bowry, F. G. Hartwell, A. A. Moffitt, Thomas D. McColl

Secretary's Message.

In view of the amount of matter appearing in this isue, the Secretary has only a few words to say.

There is still nearly $70 due the Association from members, and it is really quite urgent that the dues be paid in; please see to it.

J. T. Byars, deputy city electrician, Kansas City, Mo., has become a member of the Association, as has also Laurin E. Hinman, city electrical inspector, Medford, Ore.

The Secretary is glad to announce that the first application for section membership has been made and accepted. The application came from the British Association of Electrical Inspectors, secretary, J. W. Cook, chief inspector, city of Vancouver, with jurisdiction over the territory including the cities of Vancouver, North Vancouver, and New Westminster, together with the municipalities of South Vancouver, Point Grey, and Burnaby. One of the members, C. H. Fletcher, city electrician of Vancouver, is already a member of our Executive Committee. The section will now choose another gentleman to act with him as its representative on the Electrical Committee and delegates to represent it at Association meetings.

All queries directly pertaining to inspection matters within the above jurisdiction should be addressed to Mr. Cook, City Hall, Vancouver, though, if it is preferred, they will be gladly transmitted through this office, upon request.

It may be of interest to the members to know that the reply originating with Mr. Fletcher to Question No. 238, relating to the wiring of a wireless connection, was really the result of quite a prolonged discussion at one of the meetings of the new section. This, it is hoped, will be one of the results of sectionalizing.

Where each section is represented on the Executive Committee it is hoped that the replies to questions in this department originating with such representatives will, while losing nothing of their individuality, still carry with them the weight of being the result of careful consideration and discussion among the section members.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

President's Message.

The Secretary has advised me that the Articles of Association recently prepared by a special committee and sent to each member of the Association have been adopted by vote of the members.

The Association is to be congratulated upon this: the new Articles of Association were prepared after months of study and conferences held both in Boston and New York; they represent the thoughts and suggestions of a considerable number of our members.

The need of changes in our articles has been apparent for some time and was really brought to a head by discussions among the members of the Executive Committee who attended the meetings in New York last March,—coupled with requests for certain membership arrangements sent to us from inspectors in several different parts of the country,—in accordance with which your present officers sought to increase the usefulness and opportunity of the Association.

Nothing stands still; there must be either a retrograding of a progressive influence. Our association is now in a position to advance carefully, but steadily, broaden its influence, and develop opportunities for the mutual helpfulness of many inspectors, electrical contractors and their employees in promoting a universal agreement upon the meaning of the Code and its application.

One thing should be clearly understood. That is: to a member of our association the National Electrical Code, upon the date of its promulgation and until a new edition appears, represents in final authoritative form the progress made toward perfecting the principles and rules governing the installation of the many appliances needed in the application of electricity in its varied forms, and is understood in every case to form the bed rock upon which we must base our requirements and decisions, being final upon all points provided for within its rules.

On points not clearly provided for, our members are expected to give to the Association such information that, through the proper channels, the succeeding issue of the Code may make the necessary provision, should the majority at the biennial sessions of the conference of the Electrical Committee of the National Fire Protection Association deem such provision necessary.

In a word, this association accepts the Code in its entirety and pledges its support for its provisions.

Our Question Department, now in its fifth year, does not attempt to change anything in the Code, nor does it attempt to present what might be considered as being official interpretations of the various rules in the questions asked and answered in the Association's organ. Its chief purpose is to offer the combined experiences of the members of the Executive Committee in the several territories in which they

operate. This method of expression has been helpful even to the members of the Executive Committee. In this Code-interpretation work of the Association we have found men in several parts of the country, removed from each other, whose wide experience in matters electrical, and as inspectors as well, makes their opinions exceedingly valuable. They are removed in point of distance from the executive officers and hence there has been no opportunity to place their experience where it would accomplish the widest possible good.

Our association, being practically international, there being a number of our membership in Canada, it is practically impossible for a majority of our members to attend the meetings which are held biennially in New York. Because of this your special committee has prepared a provision in the new Articles of Association, to meet what many have felt to be a need, for the admission of any association of electrical inspectors into the National Association, in a body, such body constituting a section with territorial limits, such limits to be determined by the section seeking admission, together with the Executive Committee. A careful reading of the full text of the Articles which appear herewith will make the arrangement clear.

Your attention is particularly called to the arrangement regarding the sending to the National Secretary of all papers and discussions after they have been delivered locally, so that they may be published where they will do the most good to our members and to the electrical inspection interests in general.

This arrangement, it is hoped, will broaden the Association's work along educational lines and give incentive not alone to the sections but to the many bright men in the inspection fields who have not as yet had a suitable medium through which to come in close touch with brother inspectors,—to take their part in educational work, there being a great opportunity for the accomplishment of a vast amount of good in fire prevention (and indeed as regards the hazard to the person as well as property), after all the real work of an inspector, through the medium of education.

There has been some talk of the need of changing the name of the National Association, and this will be seriously considered should there be sufficient sections admitted to warrant it. Some have suggested the name "International Association of Electrical Inspectors" while some have suggested "American Association" as a suitable name to meet the needs of both sides of the boundary. In view of the fact, however, that a body such as the National Fire Protection Association has apparently found its name no stumbling block, the special committee did not feel that it was necessary to consider such a change at this time, although the Executive Committee is always ready to consider suggestions from any one.

While these new Articles have only recently been adopted, I am in receipt of information which leads me to believe that we shall soon see several sections admitted to membership. At this time they have been presented to the members of the National Association only. The National Secretary is prepared, however, to answer any questions and to give information regarding them to the officers of any association of electrical inspectors or to any persons desiring to organize an association.

In closing, may I say a word concerning the National Electrical Code, Edition of 1913, copies of which all our members have received? As an association we had a part in its preparation. As an association we were represented on the Electrical Committee by a duly elected and accredited representative, James E. Cole, Commissioner of Wires of the City of Boston. As an association we have accepted it in its entirety. I now request, as your president, that every member give to the National Electrical Code his earnest and active support. "Let the Code decide" is the safest axiom for the inspector. Such a position will ultimately gain for any inspection bureau the respect and confidence of every right thinking electrical contractor and public-service corporation representative.

There are some changes in the new Code from the 1911 edition. These represent the wider experience of the electrical fraternity in the past two years. Should it prove difficult to convince any portion of a territory that these changes are necessary, your executive officers are selected partly to lend their efforts in such ways as may prove of assistance in securing an undivided acceptance of the new requirements. We should not be discouraged if we fail in our first efforts to have the people of our several territories recognize the need of certain changes, but eventually an inspector can succeed, and our officers will be only too glad to render assistance in the more difficult problems and territories. There is not a rule in the Code such that there is not a very good and sufficient reason for its being there. If inspector and contractor alike will let the Code decide, a most happy condition will be the result.

With heartiest and best wishes for the success of the Association and each of its members,

Your President,
Thomas Henry Day.

Articles of Association.

1. **Name.** The organization shall be known as the National Association of Electrical Inspectors.

2. **Object.** The object of this Association shall be the promotion of uniform interpretation and enforcement of rules governing the installation of electric wiring and apparatus, the securing of a better and more uniform standard of electrical construction, and the dissemination of information and correct practice among its members.

3. **Officers.** The officers of the Association shall be a president, vice-president, secretary, treasurer, delegate to the Electrical Committee of the National Fire Protection Association and an Executive Committee which shall be composed of the above officers, not over twenty members at large to be appointed by the president, and two members from each section.

4. **Duties.** The duties of all officers shall be such as usually pertain to their offices, unless otherwise assigned by the Association. The secretary shall also act as secretary of the Executive Committee.

5. **Executive Committee.** Ten members shall constitute a quorum for the transaction of business. The Executive Committee shall have entire charge of the Code-interpretation department of the Association's activities, shall determine the manner of carrying on the same and provide suitable regulations therefor.

Subcommittes may be appointed from time to time upon the recommendation of the president, vice-president, secretary and chairman of the Executive Committee, subject to the approval of the Executive Committee: their duties to be those assigned at the time of appointment and such as are properly collateral thereto, together with any others which may be assigned to them by the Association at its meetings.

The president shall be ex-officio a member of all committees (except a nominating committee when such is appointed), and may designate as his proxy any other officer of the Association.

The Executive Committee shall determinal from time to time the basis of voting referred to in Section 9 of these Articles in such manner as may seem most equitable.

6. **Meetings.** (A) **General Meeting:** The General meeting of the Association shall be held biennially in the City of New York, just prior to the open meetings of the Electrical Committee of the National Fire Protection Association, and due notice thereof shall be given to each member by the Secretary at least three weeks in advance thereof.

(B) **Special Meetings:** Special meetings may be called by the Executive Committee, or upon written application of twenty members of the Association to the Executive Committee. Notice of such meetings shall be sent to each member at least three weeks in advance thereof, stating the business to be transacted and no other business shall be entertained.

(C) Unless otherwise provided for, all matters necessary to be submitted to the Association at large, during the interval between successive general meetings shall be referred to the members individually by the Secretary by

mail, in such form as the Executive Committee shall direct.

7. **Elections.** The president, vice-president, secretary, treasurer (these two offices may be held by one person) and delegate to the Electrical Committee, National Fire Protection Association, shall be elected at the general meeting, and shall hold office for two years or until their successors shall have been elected. The chairman of the Executive committee shall be appointed by the president.

8. **Order of Business.** This shall be: Roll call, reading of minutes of last general (and intervening special) meetings, election of members, reports of officers and committees, unfinished business, election of officers.

Roberts Rules of Order shall govern at all meetings, in the absence of special rules. All committees contingent on the business of the meeting shall be appointed by the presiding officer.

9. **Voting.** At the meetings of the Association each section shall be credited with one vote for each ten members in good standing (unless such basis) of voting shall be changed at any time by the Executive Committee in accordance with Article 5), as certified to by its secretary during the month of January in each year, to be cast as a unit by its duly accredited delegation. Each officer of the National Association and each member of the Executive Committee shall be credited with one vote. The vote of the members unaffiliated with any section shall be determined as follows: Each member present shall vote upon the question and the votes shall be collated by the secretary upon the same basis of voting as defined above. In case the Association so directs, any question before the meeting may be referred in writing to the absent members who shall within one week after receipt return their votes to the secretary, who shall collate them upon the same basis of voting as above and report the final result to the Association in such manner as the president shall direct.

10. **Vacancies in Office.** When occurring for any cause between general meetings, the Executive Committee shall fill such vacancy for the remainder of the unexpired term.

11. **Membership.** There shall be three classes of members: active, associate and honorary.

Active membership shall be confined to: (A) Sections as hereinafter provided for. (B) Persons who shall be regularly engaged in or having charge of the inspection of electrical equipments in the interests of municipalities, fire insurance organizations, or public service corporations for electric light and power purposes. (C) Retired inspectors.

Associate membership shall be confined to persons interested in, or whose principal business is the furtherance of the objects of this Association, either individually or as representatives of firms or corporations in whose names such membership is taken. Associate members shall have all the rights and privileges of active members except those of voting and holding office.

Honorary membership may be conferred upon persons who for more than ten years have been connected with the work of electrical inspection, upon a favorable report by the Executive Committee and a majority vote at a regularly called meeting of the Association. This membership carries with it the privileges of active membership without dues.

The dues of this association shall be such as may from time to time be determined by the Executive Committee, subject to the approval of the Association by not less than a two-thirds vote of those present at a general meeting.

12. **Sections.**

(A) **Qualifications.** Any organization of electrical inspectors—either insurance, municipal or public service corporation—or any organization consisting of a combination of part or all of the above named; may upon application to the secretary and upon the approval of the Executive Committee of the National Association of Electrical Inspectors, be admitted to the above named Association as a Section; provided, however, that the principles and intent of the National Electrical Code shall be the standard accepted by said organization for the supervision of electrical construction and installations.

(B) **Self Governing.** Upon being admitted to the Association as a section no organization will lose its individuality as an organization, nor shall it yield its power to be self-governing. The section, however, shall support the National Association in its efforts to secure a universal acceptance of the current requirements of the National Electrical Code.

(C) **Dues.** Each section shall have the right to agree upon and levy its own dues and membership fees. Each section shall, however, pay annually to the treasurer of the National Association a fee of one dollar for each member; and at the time of joining the National Association a membership fee of two dollars. All members of a section, while in good standing therein, shall receive copies of the official organ of the Association, and all other matter that may be issued by it. In case a member does not desire to receive the official organ of the Association the fee for such member shall be fifty cents.

(D) **Territory.** The limits and extent of territory of any section shall be determined by the officers of the Association applying for the privileges of a section, subject to the advice and consent of the Executive Committee of the National Association.

(E) **Meetings.** Meetings of the sections must be held at least bi-monthly, except during the summer months. The section secretaries shall report to the secretary of the National Association all papers which may be read before the sections and all discussions which may take place upon them, if in their opinion such discussion tends to the advancement of the work of electrical inspection, and such papers and discussions may be published in full or in abstract in the official organ of the National Association if its Executive Committee so directs. Any report of a paper or discussion published in any other way (unless authorized by the Executive Committee of the National Association) shall carry a statement that it represents only the personal views of the author and not the position of the Association. Each section shall forward promptly to the secretary of the National Association such material relating to the Code-interpretation work as may from time to time be called for by the Executive Committee of the National Association in its regulations controlling the conduct of this work, or otherwise.

(F) **Representation.** At its January meeting preceding the general meeting of the National Association each section shall elect two of its members to represent the section on the Executive Committee of the National Association. The members so elected shall act with the rest of the Executive Committee and the officers of the National Association in the Code-interpretation work and in the management of the affairs of the National Association.

The section shall receive due representation through the delegate of the National Association at all meetings of the Electrical Committee, National Fire Protection Association.

The section shall be represented at all meetings of the National Association by a delegation (of such size as the section may desire) which may be sent from the section itself or appointed from among any members of the National Association located near the place of meeting, properly accredited and instructed as the section prefers.

(G) **Code Work.** Suggestions for the revision of the National Electrical Code arising from the experience of the territory represented by the section shall, when approved by the section, be submitted to the secretary of the National Association, who in turn shall submit them to the Executive Committee of the National Association, to the end that after thorough consideration they may be presented to the Electrical Committee of the National Fire Protection Association in such a form as to have due weight and reasonable claim to consideration.

(H) **Associate Members.** Each Section shall have the right to have associate members if it so desires. Such members must meet the qualifications for such membership in the general by-laws of the National Association (Article II).

(I) **The Purpose** of the National Association being in part to act as a clearing house between the sections, each section secretary shall keep the Secretary of the National Association fully informed of all matters of general interest and importance which have arisen in the territory of the section, so that even if not published, he may bring them to the attention of the other sections for mutual benefit and consideration.

13. **Amendments.** These Articles may be amended at any meeting of the National Association by a two-thirds vote of the membership present, due notice of the proposed amendment having been sent in writing to each active member at least three weeks prior to the date of meeting.

NOTE: In reference to Article 12, Section D, Territory, the intention of this section is to give such supervision that sections shall not inequitably overlap each other's territory, that the territory of a section shall not in general be so large that the members cannot get together without great difficulty. It is not intended that the National Association should exercise any arbitrary authority.

Exports of copper from the United States for the first nine months of 1913 were 293,118 tons; for the same period in 1912, 254,300 tons.

Legal Notes

Central-Station Power Rates.

The Uniform Electric Rate Association has obtained an opinion from Louis D. Brandeis in answer to a number of questions which were submitted to him and has published it in pamphlet form. The questions were accompanied by a statement alleging that there is a general movement in the United States to establish a monopoly in the electric business in each city and that in order to exterminate isolated plants it is customary for central stations to offer rates to those who might otherwise operate such plants which frequently are less than the cost of supplying energy; that such central-station companies reimburse themselves for these losses by charging unreasonably high rates to small consumers; that the suppression of isolated plants is a disadvantage not only to such small consumers but also to the manufacturers of machinery and supplies for such plants; and that the facts do not bear out the excuse given for this discrimination, which is that the unit of cost of supplying large customers is very much less than for small consumers.

The questions were as follows:

(1) Assuming that the cost of producing and delivering electric energy is the same per unit regardless of quantity or the purpose for which it may be employed—and in the absence of any statute regulating or limiting the prices at which it may be sold: May a public service corporation charge a different rate for current when used for light than when used for power? May such a corporation charge a lower rate for a larger (wholesale) than for a smaller (retail) quantity, delivered at the same time and under similar conditions? May such a corporation charge A 10 cents per kilowatt-hour for 200 kilowatt-hours per month and B two cents per kilowatt-hour for 20,000 kilowatt-hours per month—assuming that the entire cost of service to each is four cents per kilowatt-hour?

(2) Assuming that there is a difference between the cost of making, delivering and selling electric energy between the wholesale and retail consumer or between the consumers of electricity for light and for power, may a public service corporation make a greater-than-the-cost difference in its selling prices?

The opinion of Mr. Brandeis is as follows:

The precise questions which you ask have not been authoritatively decided in the United States, but the principles which must govern are definitely established. Where no specific statute or ordinance controls the actual or relative price to be charged by electric companies for their services, the right to charge depends, of course, upon the common law; and no good reason exists why the rule governing the relation of electric companies to the public, in respect to charges, should differ from that governing the conduct of the business of other public service corporations.

It is well settled that ordinarily every public service corporation must give to all members of the public equal opportunities in rates, as well as in service. A public service corporation may charge only a reasonable rate; but no rate can be fair or reasonable which is discriminatory; that is, which gives to one class of users a preference over another class.

This rule does not, of course, prevent a reasonable classification in use. It merely requires that all persons served under similar conditions shall be treated alike.

The first question to be decided is, therefore, this: Is a use in large or wholesale quantities similar to a use in small or retail quantities? And the answer to that question must depend largely upon matters of fact. If, as assumed in the question submitted by you, the cost of producing and delivering electric energy is the same per unit regardless of the quantity supplied (all things taken into consideration), then the users in large or wholesale quantities must be deemed to be taking the electric energy under substantially similar conditions; and no legal justification exists for discriminating between them.

The decision of the Supreme Court of the United States in Western Union Telegraph Company vs. Call Publishing Company (181 U. S. 92, 100) shows this clearly. The telegraph company charged the Lincoln (Neb.) *Daily Call*, for its Associated Press dispatches, at the rate of not less than $5.00 per hundred words daily per month; and charged the *Nebraska State Journal*, another newspaper published at Lincoln, for its Associated Press dispatches, only $1.50 per hundred words daily per month. The two papers differed in the numbers of words taken, and there were possible differences also in respect to the time and exact circumstances under which the service was rendered. The *Call* complained that that difference in charge was an unjust discrimination. The jury so found, and the Court sustained its finding as follows:

"Common carriers, whether engaged in interstate commerce or in that wholly within the state, are performing a public service. They are endowed by the state with some of its sovereign powers, such as the right of eminent domain, and so endowed by reason of the public service they render. As a consequence of this, all individuals have equal rights, both in respect to service and charges.

"Of course, such equality of right does not prevent differences in the modes and kinds of service and different charges based thereon. There is no cast-iron line of uniformity which prevents a charge from being above or below a particular sum, or requires that the service shall be exactly along the same lines. But that principle of equality does forbid any difference in charge which is not based upon difference in service, and even when based upon difference of service, must have some reasonable relation to the amount of difference, and cannot be so great as to produce an unjust discrimination."

The rule forbidding discrimination on the ground of mere quantity of service has been recognized for over 30 years in railroad transportation, having been laid down by Judge Baxter in the famous decision of John Hayes & Company vs. Pennsylvania Railroad Company (12 Fed. Rep., 309). In that case, it appeared that the railroad company had fixed a rate between certain points at $1.60 per ton, with a rebate of from 30 to 70 cents per ton to all persons or companies shipping 5,000 tons or more during the year—the amount of rebate being graduated by the quantity of freight furnished by each shipper. Under this schedule the plaintiffs were required

to pay higher rates on the coal shipped by them than were exacted from other and rival parties who shipped lesser quantities; but the railroad company contended that if the discrimination was made in good faith, and for the purpose of stimulating the product, and increasing its tonnage, it was both reasonable and just, and within the discretion confided by the law to every common carrier.

The court held the discrimination was illegal, saying:

"The discrimination complained of rested exclusively on the amount of freight supplied by the respective shippers during the year. Ought a discrimination resting exclusively on such a basis to be sustained? If so, then the business of the country is, in some degree, subject to the will of the railroad officials, for, if one man engaged in mining coal, and dependent on the same railroad for transportation to the same market; can obtain transportation thereof at from 25 to 50 cents per ton less than another competing with him in business, solely on the ground that he is able to furnish and does furnish the larger quantity for shipment, the small operator will sooner or later be forced to abandon the unequal contest and surrender to his more opulent rival. If the principle is sound in its application to rival parties engaged in mining coal, it is equally applicable to merchants, manufacturers, millers, dealers in lumber and grain, and to everybody else interested in any business requiring any considerable amount of transportation by rail; and it follows that the success of all such enterprises would depend as much on the favor of railroad officials as upon the energies and capacities of the parties prosecuting the same. * * and a discrimination in favor of parties furnishing the largest quantity of freight, and solely on that ground, is a discrimination of capital, and is contrary to a sound public policy, and a wrong to the disfavored party, for which the courts are competent to give redress."

The mere fact that in the case of the wholesale customer for electric energy the public service company would be exposed to the competition of a possible isolated plant; whereas in the case of the retail customer there is no possibility of his supplying himself, does not afford any legal justification for difference in charge. In other words, the possibility of competition is not to be taken into consideration in determining the reasonableness of the classification.

This proposition was also clearly stated in a notable decision of Judge Baxter in Handy vs. Cleveland & Marietta Railroad Company (31 Fed. Rep., 689). In that case a receiver of the railroad charged Rice, a refiner of oil, 35 cents freight per barrel, while it charged the Standard Oil Company only ten cents per barrel for a like service, and in addition gave it a rebate of 25 cents on all oil shipped by Rice. The justification offered for this discrimination was that the Standard Oil Company owned a pipe line, by means of which it controlled a large amount of freight, which the railroad wished to secure; that the railroad had to yield to the company's demands, for the company would otherwise extend its pipe lines, and carry all the oil through the pipe line.

The court held that these facts constituted no excuse for the discrimination, saying: "Railroads are constructed for the common and equal benefit of all persons wishing to avail themselves of the facilities which they afford. * * All unjust discriminations are in violation of sound public policy, and are forbidden by law. * * Except in the mode of using them, every citizen has the same right to demand the service of railroads on equal terms that they have to the use of a public highway or the government mails."

The United States Supreme Court affirmed this principle in a recent case, Interstate Commerce Commission vs. Baltimore & Ohio Railroad Company (225 U. S., 326), holding that the fact that a more favorable rate was necessary to secure the business as against a competitive carrier, would not justify discrimination; and this case shows also that differences in rates can be justified by differences in classification only when the classification rests upon substantial differences in service.

The field of transportation furnishes an instructive illustration of what is permissible classification as between service in large and in small amounts. Carload rates may be properly lower than less-than-carload rates, because the service rendered is distinctly different in the two classes of service; but no lower rate can be given to one who sends 50 L. C. L. packages than if he sent only one, and no lower charge can be made to him who ships in ten carload lots, or indeed in train loads, than to him who ships in a single car.

In the past, the common commercial view of selling cheaper in large lots prevailed to some extent in the public services; but the tendency toward equality of treatment of all customers has grown ever stronger. Indeed, even in progressive private businesses, particularly those operating under patents, copyrights, or trademarks, the need of treating all customers alike, regardless of the quantity of their purchases, is becoming widely recognized. It seems clear that the tendency in our public service commissions and our courts must be toward an ever stricter enforcement of the rules against discrimination.

I am, therefore, of opinion: (1) Assuming that the cost of producing and delivering electric energy is the same per unit regardless of quantity supplied, and in the absence of any statute regulating or limiting the price at which it may be sold, a public service corporation cannot legally charge a lower rate for a larger (wholesale) than for a smaller (retail) quantity delivered at the same time and under similar conditions.

(2) Assuming that the cost of producing and delivering electric energy is the same per unit regardless of quantity supplied, and in the absence of any statute regulating or limiting the price at which it may be sold, a public service corporation cannot charge A 10 cents per kilowatt-hour for 200 kilowatt-hours per month and B two cents per kilowatt-hour for 20,000 kilowatt-hours per month, delivered at the same time and otherwise under similar conditions, assuming that the entire cost of service to each is four cents per kilowatt-hour.

(3) Assuming that there is a difference between the cost of making, delivering and selling electric energy between the wholesale and retail consumer, a public service corporation can, in the absence of any statute regulating or limiting the price at which it shall be sold, make a higher price to the retail customer, but the difference in the selling price may not be substantially greater than the difference in cost.

(4) As to the right of a public service corporation to make a substantial difference in its charges, based upon the broad purpose for which it is used, namely, a difference between light and power, there is more doubt. Some decisions in the state courts would seem to justify such discrimination; but the great weight of authority, as well as of reason, seems opposed to permitting any discrimination based upon the use to which the electric energy it put; and therefore upon the facts assumed in the question such discrimination between charges for electric energy used for power, and charges for electric energy used for light, should be held illegal.

On the other hand, the difference between day use, when the demand upon the station is small, and evening use, when the demand upon the station is large, seems a proper basis of classification of service; and a court might, for this reason, upon the facts disclosed in a particular case, hold that use for power, as calling mainly for

day use, fell within a different class of service than use for light.

It seems clear, however, that mere difference in the value of the service or its character to the user does not afford any justification for discrimination as to rates.

Very closely in point are the decisions in regard to the supply of natural gas. In Bailey vs. Fayette Gas-Fuel Company (193 Pa., 175), it was held that a natural gas company organized to supply gas for heat, light and other purposes had no power to make a difference in price according to the use to which the gas was put by the consumer; that is, making a lower price for gas used for power than where it was used for light. The court said:

"The regulation in question seeks to differentiate the price according to the use for heating or for light. It is not claimed that there is any difference in the cost of the product to the company, the expense of supplying it at the point of delivery or its value to the company in the increase of business or other ways. Some effort was made to show increased risk to the company from the use of gas for lighting purposes, but the evidence of danger was so remote and shadowy that it cannot be considered as more than a mere makeweight. The real argument seeks to justify the difference in price solely by the value of the gas to the consumer, as measured by what he would have to pay for a substitute for one purpose or the other if he could not get the gas. This is a wholly inadmissible basis of discrimination."

In Richmond Natural Gas Company vs. Clawson (155 Ind., 659), the same decision was reached. There the company sought to fix the price of gas for fuel purposes at 12.5 cents per thousand cubic feet, and to those consumers who used it both for fuel and illuminating purposes, at 20 cents per thousand cubic feet. The court held that this was an unjust discrimination.

In Mooreland Rural Telephone Company vs. Mouch (96 N. E., 193), the Appellate Court of Indiana held that the telephone company could not justify a discrimination in charges for telephone service between those who were "business men" and those who were not. The same conclusion was reached by the Supreme Court of Oklahoma in Hine vs. Wadlington et al. (124 Pacific Rep., 299).

In Postal Telegraph-Cable Company vs. Cumberland Telephone & Telegraph Company (177 Fed. Rep., 726), the United States Circuit Court held that the telephone company could not charge the telegraph company a greater rate for service than it charged other business houses for similar service, merely because the telegraph company derived a greater profit in the use of its telephone for receipt and delivery of telegraph messages, since the rates chargeable by the telephone company must depend upon the character of the service rendered, and not upon the value of the service to the customer.

Progress of Power Supply on the Rand.

The Victoria Falls and Transvaal Power Company shows a profit of $2,232,000 for the past year, which is an advance of $616,430 on the figure of the previous year. A. E. Hadley, managing director, says that the total power supplied along the fifty miles of the reef is at the present 140,000 horsepower, with a further 40 per cent on this in sight to meet consumers' requirements. It is estimated that by early in 1915 the total capacity of the power stations of the Victoria Falls and the Rand Mines companies will be about 265,000 horsepower. In regard to energy supplied, the undertaking ranks as the largest supply company in the British Empire, and it is exceeded, and that only slightly, by not more than two or three in the world. The boilers are burning on an average 1.5 tons of coal per minute. Mr. Hadley, addressing shareholders of the company in London on September 26, said that after carefully reviewing the knowledge acquired in the last five years under the conditions existing on the reef, and after examining the practice and installations employed in the largest American plants, he could say that the Rand system embodied the best modern experience in the methods of supplying power on a large scale, and were they about to lay out the system again, having the benefit of recent experience they would not make any material modifications. In view of the rate of obsolescence in earlier electrical enterprises this was a matter of great importance. Experience gained both in South Africa and America had brought about improvements in details and these had already been added to the plant, or were being introduced as opportunity permitted, thereby improving the reliability of supply. The difficulties arising through lightning, which was very severe on the Rand, had been closely studied and perceptibly reduced during each of the last two seasons, and the reliability of the supply compared most favorably with that of any similar undertaking that he had seen in other districts which were subject to heavy lightning storms. The coal consumption of the generating plant was lower than Mr. Hadley had seen in any other plant.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.

Annual Convention, Chicago, October 20-24.

As noted in our last issue, the sixth annual convention of the Association of Railway Electrical Engineers was held at the Hotel La Salle, Chicago, October 20 to 24, with an attendance far in excess of any previous meeting. The convention was opened on Monday night with an informal reception and dance held in the East Room of the hotel. The first business session was called to order by President D. J. Cartwright on Tuesday morning, and following a brief opening address reports of various standing committees were taken up. A brief abstract of the report of the Committee on Standard Reports for Operation, which was presented at the morning session by F. E. Hutchison, was published in our last issue.

At the afternoon session Secretary Andreucetti presented the report of the Committee on Head-End Equipment. This report presents a series of notes dealing with the practice obtaining on the various trunk lines using the head-end system for electric train lighting. Numerous wiring diagrams are shown. The committee recommends that owing to the numerous methods of wiring and installing head-end systems in dynamo cars, a standard system should be adopted. The report was referred to the Committee on Standards in order that such action might be recommended if it was found advisable.

The report of the Committee on Terminal Facilities for Handling Car-Lighting Equipment was next presented by George B. Colegrove. This report describes battery houses best suited for housing storage batteries at railway terminals and tools required for maintaining and repairing batteries. Mention is made of storage-battery trucks for handling batteries at terminals. Electric soldering irons and furnaces were recommended in preference to those heated by gas or charcoal. Among those taking part in the discussion of this report were D. J. Cartwright, George B. Colegrove, E. S. MacNab, F. McGary and H. C. Meloy.

The next report was that of the Committee on Electric Head Lamps, which was read by Charles R. Sugg. This report gives complete tabulation of the laws in effect in states regulating locomotive headlights. A wide divergence in requirements for head-lamp intensity is shown by these statutes, which require certain intensities at definite distances without specifying the conditions under which these intensities shall exist. General descriptions of electric head-lamp equipment and construction

are contained in the report and also forms for tabulating performance data.

The session on Wednesday morning was opened with a presentation of the report of the Committee on Methods of Charging Storage Batteries, of which J. R. Sloan was chairman. This report considers in detail all known methods of charging storage batteries giving the advantages and disadvantages of each. The subject is divided into three parts indicative of the service in which the battery is used, viz.; straight storage, head-end and axle generator. Following this, the report of the Committee on Standards, which is divided into three subcommittee reports was presented. The subject covered by the subcommittees are dynamo suspension; adoption of standard car-lighting reports by the M. C. B., and lamp specifications.

A paper was presented by Preston S. Millar entitled "The Problems of Incandescent Lamp Testing." This paper which will be treated in a subsequent issue was discussed briefly by B. F. Fisher, Jr., who emphasized the fact that lamps should be operated at the voltage for which they are intended if the best results are desired. He stated that the determination of life-correction factor is based on initial watts per candle and asked if railways in making tests were using any other standard. Mr. Millar stated that the Electrical Testing Laboratories are now conducting tests based on average watts per candle throughout the average life of the lamp. These tests have not progressed sufficiently to draw any definite conclusions.

The report of the Committee on Wire and Cable Specifications was presented by W. A. Del Mar at the afternoon session. This report deals with order forms to be used in ordering wire, general specifications for wire and cable and terminology. R. H. Rice, of Chicago, discussed this report briefly calling attention to its comprehensiveness and its similarity to the report of the American Electric Railway Association committee on the same subject. While the specifications are different in form and do not cover an extensive field as Mr. Del Mar's report, the same general outline has been followed by the street railway committee. F. J. White spoke of the grade of rubber specified in the report, stating that it is lower than most individual railroads are using. Mr. Del Mar closed the discussion, pointing out the need for this committee co-operating with similar committees of other associations so that uniform specifications can be drawn up.

The report of the Committee on Installation of Wiring for Electric Light and Power in Railway Buildings, of which A. J. Farrelly is chairman, was then read by Joseph Andreucetti. This report and the report of the Committee on Outside Construction and Yard Lighting, which was next presented, will be treated at considerable length in subsequent issues. Both reports deal with detailed electrical construction involved in wiring railway buildings, such as car barns, roundhouses, etc., and are of interest to electrical contractors.

The session on Thursday morning opened with a report by C. R. Gilman, of the Committee on Data and Information and Question Box. Very little interest has been shown in the Question Box and suggestions towards making this feature more popular were made by Messrs. Billau and Reed.

Illumination.

The report of the Committee on Illumination was then made by Chairman L. S. Billau. This report dealt principally with tests which have been carried on by the committee with the assistance of certain manufacturing concerns at the Collinwood shops of the Lake Shore & Michigan Southern Railway at Cleveland, O. The tests lasted about eight weeks and employed a modern 70-foot coach. They covered an investigation of the relative merits of center-deck and half-deck systems of locating the lighting units, their proper spacing, the efficiency, illumination intensity and uniformity of distinctive types of both gas and electric units. The test car and test methods were described and a discussion given of the factors to be considered in selecting a system, namely, quality of illumination produced, cleaning costs, reflector breakage costs, artistic merit, fixture installation and maintenance costs, and efficiency and uniformity of distribution. Diagrams of the car and curves showing the distribution of intensity of illumination were given. The following conclusions were drawn: equally satisfactory illumination from the standpoint of efficiency, uniformity of distribution and absence of objectionable shadows are obtained with either center-deck or half-deck lighting. The costs of cleaning and maintenance are greater, however, with the half-deck arrangement. With direct systems of lighting the spacing of units must not be greater than six feet to secure good uniformity of illumination. The color of the head lining has no appreciable effect except with units transmitting much of the light to the ceiling. Light-colored head linings are recommended, however, to produce a cheerful effect. The illumination values obtained indicate the desirability of a lamp of higher lumen rating. A wide range was found in the efficiency of the lighting units tested, which can be classified into groups which in the order of illumination efficiency are as follows: mirrored-glass reflectors, clear prismatic reflectors, heavy-density opal reflectors, bowl-type prismatic reflectors, medium-density opal reflectors, prismatic satin-finish reflectors, light-density opal reflectors, semi-indirect units, Pullman standard opal diffusing shades, reflecting and diffusing globes, indirect units, bare lamp, light-density opal globe.

The discussion was opened by A. J. Sweet, who pointed out that the committee report was the first comprehensive report on this subject to be made from the side of the consumer. He went somewhat into the details of the report and stated that center-deck lighting was preferable from the artistic standpoint but that half-deck lighting might be preferred by some railroads on account of its advertising value. Regarding the conclusion that about two foot-candles was the best illumination for cars he pointed out that generally 1.9 foot-candles on a 45-degree plane represented about 2.5 foot-candles on a horizontal plane. This intensity should be provided not for the initial installation but for average service during use. Allowance must be made for depreciation, which usually amounts to about 30 per cent. Illumination in cars is usually insufficient. A lamp giving about 600 lumens is needed in place of the lamp now generally used giving 400 lumens. Mr. Sweet favored rating lamps in terms of lumens when designating the size. An installation which is common today, consisting of a 15-watt lamp every two seats, is condemned by the results of this report. He stated that the accuracy of the results given was within two per cent and they are, therefore, much more reliable than most tests which can be made by individual companies, as the latter are seldom reliable to better than 10 per cent. The effect of different systems of illumination on the eye could not be investigated by the committee on account of lack of time and funds. He referred in this connection to the results obtained by Dr. Ferree and reported in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, September 6.

J. L. Minick explained that the final publication of data will include illumination intensities on a horizontal plane as well as on the 45-degree plane. He stated that indirect and semi-indirect systems of illumination are generally preferable, but since they would require at least double the current necessary for direct lighting they were out of the question in the lighting of cars, since it is already a problem how to furnish sufficient current for the lighting. He pointed out that rating lamps in lumens would make trouble for inspectors and those who are not familiar with this term. He therefore preferred a rating in watts and would leave it to the engineer to consider the corre-

sponding value in lumens in designing the installation. He also considered that the value of 600 lumens was not yet definitely established, since the depreciation of 30 per cent involved in this selection did not apply to all railroads, and it would be a mistake to standardize this value at the present time.

Preston S. Millar pointed out that one conclusion in the report was in contradiction to the report made last year and he thought last year's report was wrong in stating that lack of diffusion of light could be counterbalanced by higher intensity. This he considered a fallacy.

Mr. Sweet did not consider the conclusions in the two reports as necessarily in contradiction. He agreed that quantity of light could not compensate for lack of diffuseness as far as eyestrain was involved. He thought that ability to see could be compensated in this way. Regarding the general appearance of the car, he stated that a jury of ten railroad men had selected a light-density opal reflector as the most pleasing installation, although it was not so efficient as some of the others.

B. F. Fisher spoke for the manufacturers, and said that they could standardize ratings in lumens whenever the railroad men could agree upon the definite requirements. Lamps can now be made with ratings as uniform as it is possible to measure on a photometer. It is no longer customary to season them, however, before they leave the factory, and consequently the initial values do not always agree with the rating. He did not consider it advisable to standardize while improvements are being made so rapidly as at present. He considered it preferable to rate the lamps in watts as at present on account of the greater familiarity with this term. He stated that the manufacturer could, as efficiencies are improved, keep either the lumens or the wattage of the lamp constant.

J. R. Cravath gave an additional reason for preferring center-deck lighting, since the glare from the paper of the average reader would be less with the source in this position. While he considered indirect lighting desirable in general, it is not feasible for car lighting, where the direct system must be used and made as good as possible.

On motion of L. S. Billau the president was directed to appoint a committee to report on the subjects of lamp position, angle of screening and lamp sizes.

At the afternoon session papers were presented by L. C. Josephs, Jr., on "The Gas-Electric Car;" and by T. B. Buckwalter on "Electrical Trucks for Handling Freight." The former paper describes in detail the operating characteristics and operating features of these cars. A typical car is described, data being presented on the motor and generator equipment, control features, general construction, etc. Tables and curves shrowing performance records of gas-electric cars are presented. The paper by Mr. Buckwalter describes briefly the storage-battery truck now being generally used on docks and at warehouses for economical handling of freight.

At the session on Friday morning the report of the Committee on Specifications for Electrical Wire Crossings for Potentials Above 100 Volts was presented by J. R. Sloan, chairman. These specifications are very voluminous and define the minimum requirements and describe the type of construction desired by the Pennsylvania Railroad in the erection and maintenance of electrical transmission, lighting and power lines of other companies at points where such lines cross the tracks, right of way or property of the railroad company.

I. E. Bennett, of Chicago, discussed this report briefly from the standpoint of the railway telegraph superintendent, pointing out that co-operation should exist between committees of the telegraph superintendents and the railway electrical engineers, so that uniform specifications for all railway crossings can be compiled.

The report of the Committee on Shop Practice was then presented by George W. Cravens, chairman. This report considers in detail three separate subjects which are recommended for consideration in railway shops: (1) electric arc welding; (2) reversing motors and automatic control; and (3) motor economy and standardization. Considerable interesting data were presented in this report which will be treated at greater length in an early issue.

At the session on Friday afternoon the reports of the Auditing and Nominating Committees were received and the election of officers held, resulting as follows:

President: C. R. Gilman, of Milwaukee.

First Vice-president: H. C. Meloy, of Cleveland.

Second Vice-president: E. W. Jansen, of Memphis.

Secretary-Treasurer: Joseph A. Andreucetti, of Chicago.

The exhibits maintained by the members of the Manufacturers' Association exceeded in number and character the displays maintained at any previous meeting. The entire nineteenth floor of the Hotel La Salle was occupied by exhibits, the following firms being represented.

Adams & Westlake Company, Adams Bagnall Electric Company, American Pulley Company, Appleton Electric Company, Benjamin Electric Company, Central Electric Company, Consolidated Railway, Electric Light & Equipment Company, Crouse-Hinds Company, Cutter Electric & Manufacturing Company, George Cutter Company, Economy Fuse & Manufacturing Company, Edison Storage Battery Company, Electric Storage Battery Company, Electrical Testing Laboratories, General Electric Company, Gould Coupler Company, Hess-Bright Manufacturing Company, Kerite Insulated Wire & Cable Company, Wm. M. Lo[illegible], manufacturers' representative, Main Belting Company, Moon Manufacturing Company, National Electric Lamp Association, National X-Ray Reflector Company, National Metal Molding Company, Holophane Works of the General Electric Company, Norma Company of America, Oneida Steel Pulley Company, Pass & Seymour, Inc., Pyle National Electric Headlight Company, Railway Electrical Engineer, Remy Electric Company, Safety Car Heating & Lighting Company, S. K. F. Ball Bearing Company, Thompson Electric Company, United States Light & Heating Company, Western Electric Company, Westinghouse Electric & Manufacturing Company, Westinghouse Lamp Company, Weston Electrical Instrument Company, Willard Storage Battery Company.

Navy Flatiron Specifications.

The Navy Department has instituted new specification for electric flatirons, for the use of the Navy, these specification to supersede those of 1911. In these new specifications it is provided that such irons shall be made to use either 80, 110 or 120 volts, as may be specified. They are to be furnished complete with light insulating stands and 8-foot asbestos twisted-conductor cords. The cords shall have a black braid, or such other color as may be approved, and shall be fitted with anti-kink springs, extending at least four inches from the iron, and approved attachment plugs to fit Edison sockets.

These irons are to be V-shaped, simple and reliable in construction, moistureproof and to be designed with interchangeable heating bases or units, which are to be easily replaceable. The terminals are to be protected against heat and short-circuiting.

Unless otherwise specified these irons are to weigh between 6 and 7 pounds; are to rise to their working temperature of not less than 200 degrees Centigrade, in 10 minutes and consume not more than 500 watts when hot. The surface of the irons is to be smooth and of a uniform heat, concentrated in the bottom plate with practically no top radiation, the handles to remain cool during their manipulation. They are to be able to withstand a breakdown test of 500 volts, alternating current, for one minute when hot, and to be capable of ironing damp cloth continuously for eight hours at rated voltage without injury, during which time the irons will not be allowed to rise above their normal operating temperature.

THE WHEATSTONE BRIDGE IN TELEPHONE PRACTICE.

By H. C. Lightfoot.

Realizing the valuable results to be derived from an intelligent use of the bridge, the following article has been written with the hope that it will prove helpful to many telephone men and lead to a clear understanding of the mathematics and general principles involved.

In Fig. 1 is shown a series circuit of 20 and 10 ohms resistance connected across a battery potential of 15 volts. The current flowing in this circuit is readily obtained by the Ohm's formula, $I=E/R$, where I is current, E volts and R resistance.

It is also evident that, having obtained

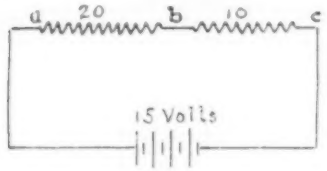


Fig. 1.

the current, the voltage drop in any portion of the circuit may be determined if the resistance is known by transposing and solving the equation for the value of E.

Substituting in the formula the values given in Fig. 1, it is found that 0.5 ampere is being maintained, and a drop of 10 and 5 volts shown, respectively, across the 20 and 10-ohm resistances. Comparing the resistances and potentials in the circuit, their ratios are found to be equal, thus,

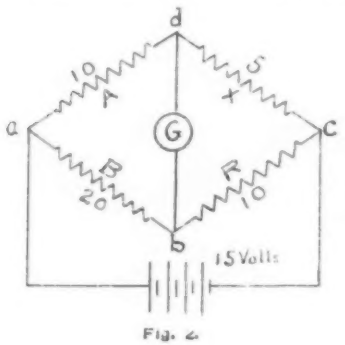


Fig. 2.

$$20:10::10:5$$

and changing the resistances to 5 and 2.5 ohms, the proportions still obtain and the ratios are equal as before,

$$5:10::2.5:5$$

It is, therefore, evident that in every circuit the potential drop varies directly as the resistance, and that the ratios of potentials to resistances, in a given circuit, are the same.

Fig. 2 shows an additional circuit connected in multiple with that in Fig. 1, but no change has been made in the battery voltage between the points a and c, though the value of the current in adc is different, and the total current in the combined circuits increased.

Solving for the values of I and E:

In circuit abc, $I=15/30=0.5$ ampere.

In circuit adc, $I=15/15=1.$ ampere.

Drop from a to b: $E=20\times0.5=10$ volts.

Drop from b to c: $E=10\times0.5=5$ volts.

Drop from a to d: $E=10\times1=10$ volts.

Drop from d to c: $E=5\times1=5$ volts.

From a study of these figures, it is seen that the potential drops between the points a and b, and a and d are the same and equal to 10 volts; and between the points b and c, and d and c, are the same and equal to 5 volts. The points b and d are, therefore, at the same potential, and no current will flow through the galvanometer G, connected as shown in the figure.

From the foregoing conclusions, it can be shown that the drop in ab is to the resistance of ab, as the drop in bc is to the resistance of bc; and by alternation, drop in ab is to the drop in bc, as the resistance of ab is to the resistance of bc. Similar relationship between voltage and resistance exists in the circuit adc.

In Fig. 2, let

y=voltage drop in ad;
z=voltage drop in ab;
m=voltage drop in dc;
A=resistance of ad;
B=resistance of ab.
X=resistance of dc.
R=resistance of bc.
D=voltage between a and c.

Then,

$$A:y::X:m.$$

By alternation, $A:X::y:m.$

By composition, $A:A+X::y:y+m.$

But $y+m=D,$

therefore, $A:A+X::y:D.$

Similarly, $B:B+R::z:D.$

Solving for the values of y and z.

$$y\ (A+X)=AD$$

$$y=AD/(A+X)$$

Similarly, $z=BD/(B+R)$

In order that no current shall flow

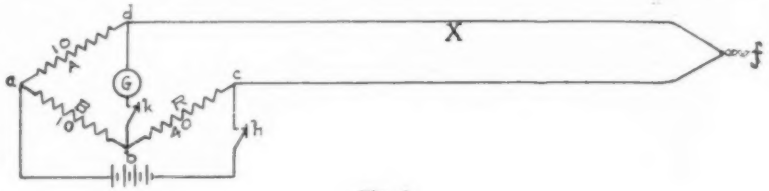


Fig. 3.

through the galvanometer, y and z must be equal; and when such a condition obtains,

$$AD/(A+X)=BD/(B+R)$$

Dividing by D, $A/(A+X)=B/(B+R)$

Simplifying, $AB+AR=AB+XB$

$$XB=AR,$$

$X=AR/B$; an equation for the value of X in terms of the resistances of the sides,

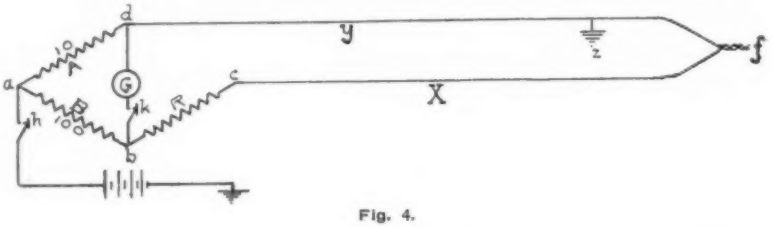


Fig. 4.

and from which it is noted the potentials have been eliminated.

This is the standard formula used in connection with the Wheatstone bridge, and requiring, for solution, no information other than the resistances A, B and R and a balanced galvanometer, to obtain the unknown quantity X.

Fig. 2, therefore, represents the circuit arrangement of the bridge. A and B are the ratio arms, R the rheostat and c and d the terminals to which the line or unknown resistance is connected.

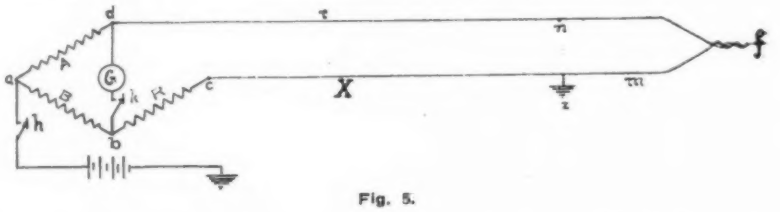


Fig. 5.

In the modern form of the bridge, the rheostat R can be varied in resistance from 1 to 10,000 ohms, and the arms from 10 to 10,000 in multiples of 10, thereby obtaining ratios adapted for the measurement of resistances over a wide range.

In measuring low resistances, the A arm should be less than the B, and for

high resistances, their values are reversed.

In Fig. 3, X represents a toll line connected to the terminals of the bridge, and crossed out at a distant point. Having determined upon the most desirable ratio for the arms, usually equal, or A 10 and B 100, for this class of work, the resistance of the rheostat is varied until no deflection of the galvanometer is noted

L=resistance of loop dfc.

L_1=actual rheostat reading for loop resistance.

Then, $y=L-X$.

Also, $A:B::y:R+X$.

Substituting, $A:B::L-X:R+X$.

$AR+AX=BL-BX$.

Transposing, $AX+BX=BL-AR$,

$X\ (A+B)=BL-AR$

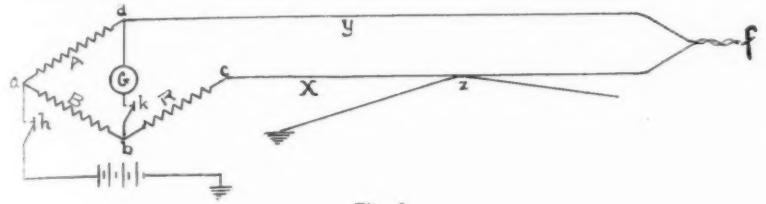


Fig. 6.

when closing the keys h and k. We will assume, for example, that 40 ohms is read on the rheostat, with equal arms. Substituting these values in the formula, $X=10\times40/10=40$ ohms, the resistance of the circuit under test. Had the arms been 10 and 100 ohms it would have been necessary to move the rheostat to 400 ohms to obtain a balanced galvanometer and answer the requirements of the formula;

$$X=(BL-AR)/(A+B).$$

This is the general formula used in locating grounds by the Varley loop method. Separate equations for the several arm ratios may be deduced from this expression;

For equal arms, $X=(L-R)/2$

For ratio 10:100,

$$X=\frac{(100L-10R)}{(100+10)}=\frac{(10L-R)}{11}, \text{ and}$$

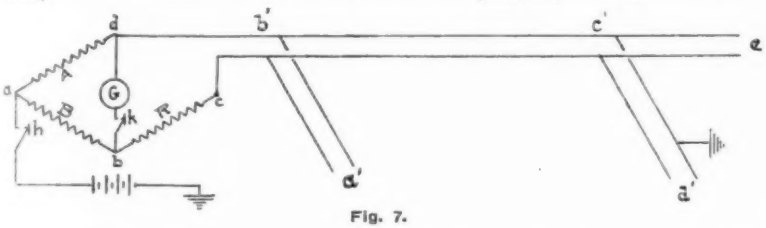


Fig. 7.

$X=10\times400/100=40$ ohms.

Changing the ratio arms does not affect the result of the test, but greatly increases the range of the bridge.

The bridge is further useful in locating crosses and grounds by the Varley and Murray loop tests; connections for the Varley are shown in Fig. 4, the fault z becoming a part of the battery circuit through ground, and in no way affecting the accuracy of the measurement, except to reduce the angular deflection of the galvanometer due to high resistance in fault, with consequent loss of battery potential across b and d.

Let

y=resistance of circuit from d to ground z.

X=resistance of circuit from c to ground z.

since $10L$ equals actual rheostat reading for loop at this ratio,

$$X=(L_1-R)/11$$

Similarly, for ratio 10:1,000,

$$X=(L_1-R)/101$$

In making a test it is necessary that one side of the loop be composed of a wire free from fault or ground and that it be connected to the faulty wire at a point beyond the trouble. The loop is first

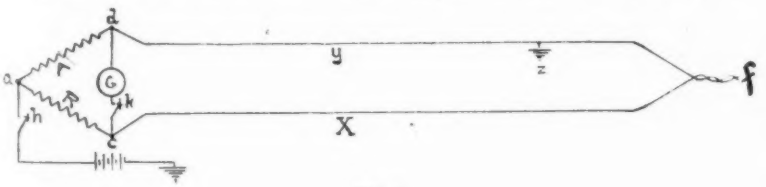


Fig. 8.

measured, using the method shown in Fig. 3 and with ratio arms the same as will be used for the ground test. With connections as indicated in Fig. 4, R is varied for a galvanometer balance, and the values of L and R substituted in the formula corresponding to the arm ratios used. The equation is then solved for the value of X, the resistance from bridge to fault z. The distance to this point may be determined by multiplying the resistance by the unit length in feet or miles per ohm for the size of wire under test.

A check upon the accuracy of measurement and calculations may be obtained by interchanging the line terminals at the bridge, substituting the new value of R in the equation and solving for the resistance of the remaining portion of the circuit. If your work is correct, the sum of the two results should equal the total resistance of the loop.

The formula for equal arms cannot be used for checking results, and is applicable only when the grounded side of the circuit is connected to c the rheostat terminal, since from the circuit arrangement in Fig. 4, it is evident that the resistance from c to z is greater than from d to z, and that it cannot be made equal, to satisfy the requirements of the formula, by changing R. When this condition obtains it is commonly known as "the bad side of the bridge," and it is necessary that the line terminals be reversed before measurement can be made. This formula is, however, very useful in toll-line measurements as it may be reduced to a simple equation by which the location of fault can be speedily determined.

Referring to Fig. 5,

Let

X=resistance of line cz,

r=resistance of line dn which is also equal to X.

m=resistance of line nfz.

L=resistance of loop.

R=resistance of rheostat.

Then

$A/B=(r+m)/(R+X)$

If $A=B$, or ratio arms equal,

$r+m=R+X$

$m=R$

The value of m, or circuit from fault through cross to point on good wire opposite fault, is shown to be equal to the reading on rheostat, and the distance from cross to the trouble can be at once determined by dividing the rheostat reading by the number of ohms per circuit mile or foot for the wire under test.

The loop test is also the most accurate method for locating crosses, the arrangement of circuit being shown in Fig. 6. One side of the crossed circuit is connected to the good wire y, while the central-office end of the other is grounded. This makes a similar arrangement to that in Fig. 4, and the point z can be readily determined.

In measuring cable faults where there are many multiple points, care should be taken to cross out the wires under test, at some location beyond the trouble.

Fig. 7 illustrates a cable pair with three multiple points and one side grounded. Should the cross for test be made at the point a' the fault would show in the splice b', crossing wires at e the trouble would be indicated at c', and only upon crossing

them at d' would the true location be obtained. It is therefore necessary to study the conditions carefully and make repeated tests in order to secure accurate results.

In calculating distance to fault, the following table gives the values for the wire sizes commonly met with in practice:

No. 22 gauge paper cable, single wire, 60 feet per ohm.

No. 19 gauge paper cable, single wire, 120 feet per ohm.

No. 14 N. B. S. copper wire, single wire, 8.5 ohms per mile.

No. 12 N. B. S. copper wire, single wire, 5 ohms per mile.

Circuit arrangement for the Murray loop, is shown in Fig. 8.

By means of a switch on the bridge the B arm is shunted out and the galvanometer connected across the A arm and rheostat. Adjust the values of A and R until a galvanometer balance is obtained, then;

$$A:y::R:X$$
$$AX=Ry$$

But, $y=L-X$

Then, $AX=R\ (L-X)=RL-RX$
$$AX+RX=RL$$
$$X\ (A+R)=RL$$
$$X=RL/(A+R)$$

where L equals the total resistance of the loop.

This formula and bridge arrangement is applicable to all the measurements previously described.

The bridge, in its common form, is provided with the necessary switching and grounding devices to accomplish all the circuit arrangements given herein.

Plant Growth Under Electric Light.

Some very interesting experiments were made in the early part of the present year by Miss E. C. Dudgeon of Defries on the propagation of plant growth by means of mercury-vapor lamps and we are indebted to the Westinghouse Cooper Hewitt Company, Limited, of London, for the following particulars. It was found as a result of tests that there was a considerable acceleration of growth and germination under the influence of mercury-vapor light, as seeds germinated several days and in some cases weeks before those sown and grown under precisely similar conditions in the control house. Table I shows some of the remarkable results obtained.

TABLE I.

	—Days to Germinate— Experimental House	Control House
French beans	13	21
Carrots	11	26
Cauliflower	6	26
Maize	8	57
Lettuce	6	12
Maple peas	6	16
Vegetable peas (Filbasket)	7	16
Oats	7	12
Barley	7	12
Wheat	8	16

It was also found that several other seeds, such as Syrian beans and Soy beans showed similar results when they were experimented upon as regards germination. The quality of seedlings was remarkably good, as they were sturdy of stem and strong in leaf. All plants responded satisfactorily to the light treatment. In addition to seeds, plants such as geraniums, roses, carnations and heliotrope were placed in the house and showed a marked increase in foliage and flowers of good size, color and shape. The rose tree Belle Lyonnaise, which had flowered all the previous summer and autumn, was pruned as bare as a vine. In two weeks it showed leaf, in six weeks buds, and continued to bloom for a considerable period. Strawberries flowered abundantly and the fruit ripened very well. It was shown that there was an increase of about 25 per cent in the crop.

In view of these startling results it is interesting to note the arrangement which was adopted. The greenhouse in which the test was taken was 20 feet long and the plants were arranged on a staging about 4 feet from the lamps. The radiation extended over the whole house, which was tested by photographic printing paper exposed after sunset. The lamp was put on about an hour before sunset and kept on for about 4.5 hours. The best results were those obtained within an 8-foot radius of the lamp; as the radiation became less the growth was less, as could very soon be seen by a casual glance over the staging. The temperature of the greenhouse was kept low, the averages for three months being given in Table II.

TABLE II.

	—Degrees— Experimental	Control
January, day	58	59
January, night	46	48
February, day	60	67
February, night	46	50
March, day	47	50
March, night	47	50

The control house was placed in a position where it got slightly more sun than the experimental house, which caused the rather higher average temperature. The earth temperature was taken at intervals during the times that the lamps were on after sunset in both houses and showed no perceptible difference.

A large amount of heating is saved and the seedlings require practically no hardening off before being planted in the open. About a dozen cauliflowers were put out in March, protected the first night by a glass shade, the next two nights by a mat thrown over them, and after that nothing. They were exposed to frost but their growth was in no way retarded and they formed remarkably strong plants. Beans and peas came on much earlier in the experiment house than in the control house, a difference of about two weeks being apparent. Lettuce and French beans failed in the control house but did well in the experimental house under the influence of the mercury-vapor lamp.

Professor Priestley of the Bristol University in a lecture delivered in London, said with regard to this experiment of Miss Dudgeon, "The light seems to have been extraordinarily efficacious, producing accelerated germination, increased growth, greater depth of color, and, more important still, no signs of the lanky, unnatural extension of plant usually associated with forcing. Rather, the plants exposed to the radiation seem to have grown if anything more sturdy than the control plants. . . . . A structural examination of the experimental and control plants carried out by means of a microscope fully confirms Miss Dudgeon's statements both as to depth of color and greater sturdiness of the treated plants."

This shows that the use of mercury-vapor light should, if carried out on a large scale, be a source of great profit to the market gardener and is therefore well worth investigation.

Destruction of Poles and Cables by White Ants.

A very interesting account of the ravages of the white ant among telegraph and telephone circuits is given in the October number of *The Post Office Electrical Engineers' Journal* of London, England. It describes and illustrates these extraordinarily active insects and the havoc they have created in various parts of Australia with wooden poles for overhead circuits and even in one instance, at Adelaide, with a lead-covered 104-pair cable laid in multiple duct tile conduit. The cable was laid in 1907 and within four and one-half years a stretch of some 20 feet had its sheathing badly eaten away.

Vienna Railways.

The Board of Trade of Vienna, Austria, has issued a report on the operation of the municipal street-railway system of that city in 1912. The system includes 165 miles of electrically operated lines, 12 miles of steam lines, and an omnibus service.

The electric lines carried 309,484,129 passengers. The receipts were $9,862,076. The average rate of fare was, consequently, 3.18 cents.

The quarterly meeting of the Western Pennsylvania Independent Telephone Association was held in Uniontown on October 24, about 40 officials attending. The next meeting will be held in January in Pittsburgh.

LEGISLATION AFFECTING PUBLIC UTILITIES.[1]

By H. V. Bozell.

The title of this paper is apt to suggest a range of information and discussion which would require more time than is here available for its consideration. An immense amount of interesting information regarding the various laws of different states and the succeeding commission orders and court decisions might be collected and presented, but that is more the work of a committee working for a long time, it is a work, however, which I hope may be done by this association at some period in the future.

My effort, in the following discussion, will be to present some of the basic ideas of legislation in general, the power of the state to legislate with reference to the business in which we are especially interested, the causes of some of the more recent legislation, the kind or general class of legislation resulting from these causes, the subsequent effects upon the utilities, the stand the utilities might well take toward this legislation for their own best interests, and, finally, to consider some of the legislation in this line in our state.

The state governments have the right to enact legislation limiting or defining the rights of individuals or groups of individuals, obtaining this from the sovereign people. Since all rights emanate from the state, these rights may be limited by the state.

Political scientists say that public utilities have still further reasons for being especially subject to regulation by legislation, or regulation provided through legislation, or any restriction coming from legislation. Public utilities, from the nature of the business done, are suffered to transact their business on the property, or by use of the property, which belongs or belonged to some one else—perhaps some one who receives no direct benefit from the operation of the utility. Sometimes, in fact often, this property is the property of the state or the public. In either case, the state steps in and provides a means—the right of eminent domain or other means—whereby the public utility may have for its purpose the property in question. This, and the fact that the service rendered is being considered more and more necessary in our complex modern life, makes the state feel that it should have a voice in the limitation of privilege or liberties of the public utilities. In some states, where there has arisen legislation giving utilities the right to hold monopolistic charters or franchises under certain conditions, there is even more reason for the state wishing to exercise its natural authority to limit or regulate the operation of the utilities.

The public utility differs from other forms of business in the way it meets the average individual. In order to perform the best service, it is, of course, monopolistic in nature. The aggrieved individual has no other place to go for the service. His only redress is to act by legislation to force the public utility to do his wish. It is hereby assumed, of course, that the average individual will make complaint to the public utility in the first place, and, failing of agreement with the operator of the utility, will seek further redress.

The chief complaints against the public utilities are, of course, poor or inadequate service, error in measuring the product, and exorbitant returns.

The judgment of the average individual as to what constitutes good service as compared to perfect service is about in proportion to his education and knowledge of the business of the public utility. If we, the members of the association, were all customers of the plant of one of our members, it would be assumed that a complaint from one of us would probably be better founded than the average complaint. Let us hope, too, that the operator would have less trouble than usual in explaining the condition necessitating the complaint. All public utilities are concerned with the operation of plants which furnish, by means of apparatus which is comparatively new to the world and whose behavior and eccentricities are not even fully understood by those most thoroughly acquainted with its manufacture and use, conveniences which are now considered almost necessities. Not only has this apparatus eccentricities of its own, but complete systems or parts of systems may often be shut down by effects of agencies beyond the control of any human being. The meager knowledge of the public—the average individual—about this apparatus, this new system, these mysterious terms, etc., is felt by us in the complaints we receive. This individual has the right to expect good service from the utility which he suffers to have monopolistic or semi-monopolistic privileges for the furnishing of that service. It is his judgment of what good service is, or of what good service is possible under the particular operating conditions in his particular case that is most at fault. Failure of gas supply, low pressure of gas, insufficient heat from his burning of the gas, a broken leg in getting off a street car, a five-minute wait on the way home, due to a street car standing still that long, a car headway of seven minutes where he wishes three or two, a fluctuation in the light of an electric lamp, an outage of a few minutes, etc., are examples of the complaints members of this association receive, due to this fact. Truly, the utility should—and it usually does—provide for the least number of such occurrences. If it does not, these complaints will be just and frequent, and if it does, they will be fewer and unfounded. In any event, they are a source of unrest against the utility and the cause, in part, of some of the legislation which has to do with the limitation and regulation of public utilities. Some of these complaints are, very evidently, not the fault of the utility in the average case. If not enough heat is obtained from the gas due to improper setting of a mixer on a burner, the company is accused of putting air in the gas mains to make the meter run faster. If a man jumps from a moving car and sustains an injury, there are several who will act as witnesses that it was the conductor's fault.

The second class of complaints is probably with the least foundation, and again comes from lack of knowledge. I refer to error in measurement. In the case of gas or electric companies, this appears in the form of a fast meter; in the case of the street railway, it appears in the length of the ride for one five-cent fare and the request for the more universal transfer, in the kicking "strap-hanger," in the request for better cars, and, perhaps, in car headway. The modern efficient manager is known to do his best to have meters correct for his own good, for as many meters are apt to be slow as fast; also, utilities are inclined to be perfectly fair, though a suspicious public has doubted this. I believe that doubt is fading in our present day, though. The street railway company hauls passengers as far as it can for five cents, it provides as many cars as possible and as many seats in each car as possible. But it is hard to convince the average individual at present, that this is so. Again, the reason lies in his lack of knowledge of the apparatus used in the first case and in the conditions in the second.

The third class of complaints is that of exorbitant returns on the capital invested, which shows itself in the cry for lower rates. This is one of the hardest complaints to meet in that it involves an immense amount of data on all sides, and is a question which is hard to settle between the best of men. It is not, as a rule, objected that the employees receive too

[1] Paper read at the second annual convention of the Gas, Electric and Street Railway Association of Oklahoma; abridged.

much pay, even including the general officers, but the fact that a 10-per-cent dividend or a 15-per-cent dividend has been declared will arouse a considerable flurry at times in the minds of the people.

Now, have the people been given reason for the complaints which have in the end provoked the legislation which has been enacted in the past few years—since public utilities became general? It must be admitted that there has been cause for complaint—too often so—on the first and third general items—quality of service and return on investment. The monopolistic character of the public utility caused some of the earlier men in these lines of business to take advantage of the public and to impose poor service and exorbitant rates (as judged by the rate of return) upon the people. The whole has suffered from the mistakes of some of its parts, and too drastic legislation has often ensued. Today, it is only fair to state, the public utilities are all doing their best to avoid all three classes of complaints. It is no secret, though, that some of the earlier enterprises were overcapitalized, or made enormous percentages on the investment, and at the same time gave little heed to the fact that service was not of a first-class nature.

All of the above, then, is the reason for the passing of the class of legislation in which we are especially interested, in that it affects the business of each and every one of us.

What is the sort of legislation which has resulted from these conditions? Has the state, in its eagerness to right supposed injustice or unfair treatment to the public by the utilities, overstepped the actual lines of justice and been unfair to the men who have made these very necessary utilities possible Has the state legislated restrictions upon utilities, basing the reason for this legislatiòn on its own views of questions with which it is not even familiar? These and many similar questions bring to our minds the many and various laws in the different states which affect the public utility business.

The first class of laws to appear in an attempt to regulate by legislation were individual in character. That is, a particular case was taken before the legislature and laws passed placing restrictions of a definite character on certain utilities or a certain utility, in some cases. Minimum and maximum rates, more often the latter, were established by legislation. Luckily, such legislation was short lived in the general attempt to effect regulation, its place being taken by the laws organizing public-utility commissions. This change is even now in its most rapidly changing state. When the general state did not attempt to regulate or restrict, the municipality did the work, the final decision resting in some court. Let us hope that individual regulation laws are disappearing in this line.

There is a class of legislation, not differing much from the above, which seems to be continually with us. I refer to what is sometimes called "fool legislation." It is a hard hybrid to define, and sometimes hard to identify or notice. It is usually the result of the personnel of the legislative bodies, and does not, I believe, represent the will of the majority. I do not wish to get into a discussion of faults of our form of government, but one fact is evident to the operators of public utilities and that is that the laws proposed from time to time, and occasionally passed, are often the result of the feelings of certain legislators who are powerful enough to place some restrictions upon all utilities in order to satisfy some personal whim or prejudice. The same result obtains from the desire to pass legislation which pleases the constituency but which is founded on fanciful ideas or personal beliefs. This legislation shows itself in laws similar to one proposed in our own legislature this session which would automatically make such rates for public-service corporations as would produce a return of 6 per cent per annum on the value for taxation purposes as determined by the board of equalization. There is no criticism in this case of the intent of the author of the bill, whoever he was, but the criticism lies in the manner of the restriction—by means of an arbitrary law without any realization of the elements entering into what might be a "fair rate of return" and without consideration of possible injustice to the owners and operators of the utilities. Fortunately, when caught and identified, these hybrids of legislation are usually easy to kill. But the public-utility operator must always be on the lookout for them and ready to explain their effects to the legislators in order that actual injustice may not be done.

Later developments in legislatures, however, have been to pass laws providing for regulation by commission. Theoretically, this law is perfectly just, provided the commission is given the same amount of power to protect the corporation as it is to protect the public. Fundamentally, a commission should be as much the court of the utilities as it is the court of the people and should provide the same amount of protection. Too often, the laws creating commissions and defining their powers and duties are badly lacking in certain essentials, which will tend toward the best common good. The legislative branch is too apt to provide only those powers which will allow it to control the utility for the public and not the public for the utility. The public can do this, of course, but it is a short sighted public, as will be shown later .

Another aspect of the commission laws is the noticeable absence in all but about two states of provisions for placing the municipally owned plants under commissions. It is argued that such plants are already controlled by the people and no further control is necessary. It is argued that it is taking from the municipalities authority which belongs to them. In the same way, is not the control of a private utility operating in a municipality as well placed in the hands of the municipality? If the state wishes to take the control of the municipal plant, it may do so, and should do so, if it takes the control of the privately owned plant. This is so for two very good and sufficient reasons: that the plant is many times better operated under the direction of a perpetual governing body, such as is a well organized commission, than under an ever changing municipal governing body; and that the justice to the capital invested in the privately owned plant is seriously hampered or impaired by having to be compared to municipal plants without regulation and with any amount of evils hidden behind forgotten bond issues, transferred accounts and contractors' profits. It seems that this should be sufficient to show that the general good of the majority would best be forwarded if the commissions had control of the municipal plants as they have of the privately owned ones.

How are these laws interpreted and how do they affect the businesses in which we are interested? It is this phase of the question which is the most interesting to us, perhaps, though an understanding of many facts of which the foregoing are a few and possibly typical is necessary in a general review of the subject.

Most legislation is aimed at rates in some way or other. The main object seems to be to see that return on the investment shall not be what is called excessive. Character of service is also aimed at, and in many places is closely connected to the rates allowed. Most individual legislation, legislation about some particular plant, or prescribing certain rules for rates, etc., is apt to be of such form as to place all cases arising under it in the courts immediately. Most such legislation is arbitrary. Court decisions are just as apt to be arbitrary on these matters. A court is composed of a man

or group of men who are removed from active life, at least from the business world. Experts on legal questions, questions of constitutionality, etc., they are confronted with an entirely new proposition and are forced to decide whether the acts of the utility come within the provisions of a given act or whether that act is constitutional on one ground or another whether the rate of return is a "fair" rate.

For a court to decide what is a fair rate is an almost impossible problem. The court, at best, depends upon transmitted intelligence and information. A great deal of this is too technical and too unfamiliar to the ears of the court. Consequently, the final decision is apt to be as much in error as the sum of all the errors the courts may make in interpreting the information it receives. The errors of testimony may be cumulative. Let us hope that they are more often compensating and that a nearer approach to justice is thereby attained. In determining a fair rate, a basis has had to be formed. The state has failed, usually, to form that basis and the work has been left to the courts in order that they may have a starting point. A fair rate on what? On some valuation of property. And what is property? Property, as I understand it, is created by the state and only that which the state declares to be property is property. Starting, then, with a physical valuation turned in to the court, the same court must decide what other values or sums presented as property or valuation by the utility may be classed as such. The people have not spoken on that subject by legislation. The courts must decide. And then follow the discussions about going value, good will, overhead charges during construction period, discounts on bond issues, engineers' and promotors' fees, etc., with the result that a figure called the value of the property is reached which may be as far from representing the real worth of the property in question as it is of a property in some adjacent town. Money actually invested in the business may be named not property. And then, with the value determined, the earnings are found to be 12 per cent or 20 per cent of that value and are called too high. A reduction of 50 per cent in earnings is ordered and the defense puts up the argument that the order or decision is unconstitutional on the grounds of the fourteenth amendment. But the court has said that, if we divide the $25,000 earnings into two piles and call the first pile the first 6 per cent on the determined value, and the second pile the second six per cent on the determined value, then the first 6 per cent is property and the second 6 per cent is not property. The court will not allow a lower rate of return than a 4 per cent, or 6 per cent, depending on local financial conditions, saying that to do so would be confiscatory, or depriving the person or the corporation of property. This point, of course, is an old and much disputed one and will require much thought and time to decide equitably.

But suppose that the utility under question is under a state commission. What, then, is the effect of the legislation. Happily, very happily, indeed, the personnel of the commissions up to date have been of the higest type. Commissions are given the very power of life and death of utilities and an unfair-minded commission, no matter how well informed it might be, is able to do an immense amount of harm, not only to the utility, but also to the public, whom it is trying to protect. It is not expected that their decisions will always meet with the approval of the utility nor of the public, but the chance is great that the resulting decision from the commission will more nearly approximate a just one than the decision by any other body or instrument.

If the state chooses to control the utilities, then, we prefer that it do so through utility commissions endowed with the proper powers to do the work in the best and most efficient manner. The utility derives benefits from the commissions—all the results are not negative on the side of the utility. One definition of government is the elimination of friction. This is often well accomplished by means of commissions. The public feels easier to know that the utility is controlled by its representatives and is less likely to look for trouble and be dissatisfied. The commission form of regulation is forcing on the utilities something which we have learned is most desirable, namely, uniform accounting systems. It is doubtful how long a time would be necessary to bring about uniform accounting systems without some form of governing body making the prescription; that is, if we were left to work out our own system and decide to follow it absolutely. Another advantage to the utility is the fact that once, the means of valuation is decided and the fair rate of return is decided, the commission practically assures the utility that it will be allowed that rate of return for so long a time as it continues to give good service.

But there is another, and perhaps more vital, question than any of the above, resulting from the present form that state control of utilities has taken —no matter through what agency that control may be exercised. I refer to the question of new capital and the consequent future of the industries operating as public utilities.

In the development of the public utility, many new and unheard-of problems were encountered. The whole proposition, from the machinery employed to the general manner of conducting the business was entirely new and untried. Money was hard to get and the only men who would go into the propositions at all were those who dared to take risks. Many risks produced losses. Those which did produce successful enterprises were very successful and the returns which came in due course of time were high, as compared with the ordinary return on the same amount of capital. But all this was done without any, exorbitant rates or schedules —at least they were never considered exorbitant until after the business had developed into a real success and the public commenced to figure the rate of return on the original investment. When the state did start to control, then, it said to this enterprising capital which had made utilities possible that it would hereafter be limited to some much lower rate of return. It was rather an ex post facto decision. This theory, as urged in some of the commissions, is thus described by Mr. Crosby: "that investments made without thought of limitation, investments made honestly in the purchase of experimental machinery, necessary for the development of an art, are no longer to be considered as entitled to those varied and sometimes large returns which were obviously in the contemplation of all when the investments were made." Suppose that all the money one is to put into a proposition now and which may, in the course of time, be swept out of actual existence by virtue of changes in machinery, shall no longer, at some day of rate regulation, have any standing in court. Suppose that all the losses of return during lean years shall have no standing in court. Suppose that all the vexatious processes which time involves in the slow building up of an enterprise shall have no place in court. Suppose that some unheard-of contract shall be let for the complete and over-night construction of the public utilities of a great city. Suppose that to this shall be added some so-called "reasonable"amounts for supervision and for various others elements more or less the subject of contention. Under these suppositions, some absurd figure is reached which, has no relation to what may have been the actual cost of the property in the last twenty-five years. Now suppose that all this is laid before an investor as the probable decision on

some future rate case of some property some twenty-five years hence, and add further that at that time he will be allowed but 6 per cent to 7 per cent upon the determined value because bonds on enterprises in the past have been floated at that rate. Will he invest? He would reject the whole proposition as absurd on the face of it. And yet, that is the treatment which is resulting from the present forms of regulation as it affects capital placed in these enterprises in the past. The public, it might be said, is really in a great partnership with the utilities, but without any definite contract. The utility has no method of determining what it will receive for its services to the public. It is not the fault of the commissions or the courts, but it is due to the neglect of the public or of the state. Commissions are given control of utilities but are forced to go at the work blindly and have no limitations or rules or instructions from the state to guide them. Consequently, the commissions give down opinions which differ widely as is possible. The utility has nothing definite. How can it go out and get more capital and how can new capital be procured for new enterprises under such conditions? This is the vital question to the utility and the most pressing effect at present of regulation and legislation about public utilities.

But what can the utility do? What standpoint or stand is there available to protect itself and the future of the industry? If we look back, we can see and remember that the public utility, when it was in the height of its earning capacity, and the high returns on the experimental investment were commencing to come in, assumed too much of what has been called the "public-be-damned" policy. Complaints were met with silence. The result of this and similar acts was to cause the public to assume militant opposition to the utility and demands were made to curb the utility. Perhaps some of the regulations imposed have been too severe, but the tendency is to come to a definite basis, and we hope for more complete and definite understandings.

Publicity and the "public-be-pleased" policy is the cry of the hour, and the importance of it cannot be overemphasized. Commission regulation has come to stay. I, for one, am heartily in favor of it, as I believe it is an excellent solution of a difficult problem. Commissions are as yet new, however, and their modes of procedure and basis of operations are not fully developed. They also lack the foundation which should be given them by the state. I think the public utility will do well to support the commissions with its full power and energy. And the way to make the decisions of the commissions just to all and every one is to have the commissions and public know the facts. This cannot be done by set speeches nor by literature and statistics, but by personal contact with the public by the managers and all the employees.

And what legislation shall the utility, which is in a good position to give information, urge upon the state as being the solution to the problem of the future? It seems to me that the chief problem at the present is to have a definite standard set whereby capital invested in the past may be allowed to continue to draw a rate of return which is its due, taking into consideration the risks of the past and the capital lost in the development of the utilities, and whereby capital invested in the future may be sure that it will not be legislated out of existence, but may continue to earn its fair return from the utility in which it is invested.

To place it all in a general view, we see that the public really has the right, if it wishes to exercise it, to control private operations. It seems to have a double right or at least an extra right or reason for the control of public utility corporations. Such rights have been exercised in the passage of regulating laws and the provision for regulating commissions. Too often, though, the people, or the courts, or the commissions have looked only at the present, and the future of the utilities affected is somewhat of a question in many places. It may be only the slow decay of years, due to the lack of ability to interest new capital, will call attention to this fault and make the state wake up to the condition which may result. It is short-sightedness. But the best position for the utility to take, for the best good, both of the utility and the public, is to support the commissions, to provide whatever data it may and to exert every influence toward publicity of those facts which will make for better relations. Needed legislation should be brought to the attention of the legislative bodies through properly formed and personed committees. And every effort which will tend toward definiteness of agreement between public and utility should be exerted.

Finally, I wish to discuss our local problems a little. Our local constitution provided for a corporation commission and gave it certain powers, though all were not well defined. Only a doubtful control could be exercised over gas and electric properties, though railroads, street railways and telephone companies were definitely included in the direct jurisdiction. Later, a gross revenue tax law was passed by our legislature, and these constitute the chief legislation affecting the member companies of this organization up to the present legislature.

The laws passed at the regular session of the present legislature confer jurisdiction on the commission to regulate water, heat, light and power companies.

Certain other legislation is a real necessity in this state, and may be forthcoming soon. I refer to provision for right of way or right of eminent domain for electric power companies over public roads, and proper legislation to protect the utility against theft of its product, and meter tampering.

Our commission lacks the power to control or regulate the municipal utilities and also the power to protect the utility which is giving excellent service against the competition of another where two utilities of the same nature cannot exist. These are needs which the state must see and provide soon.

Development in many instances is dependent upon the development of the public utilities, and the development of the utility depends upon the attraction of capital to the business. Our main problem, then, is to make Oklahoma laws and operating conditions such as will attract this capital to the upbuilding of our utilities.

Mathematics for Electrical Engineers.

In his inaugural address to the Manchester Association of Engineers on October 11, Edward Hopkinson, president of the Association, said among other things:

"No electrical engineer can acquire a competent knowledge of his subject without a knowledge of mathematics. This absolute dependence of electrical engineering on mathematics, has, I do not doubt, had an altogether salutary effect on its development which has extended as I have endeavored to show in some instances to other branches of engineering. It attracted many of the most powerful scientific minds of the latter part of the last century to devote themselves to the elucidation of its problems and to the determination of its fundamental constants to a far greater degree than in other branches of engineering. It is remarkable that so early as 1882 in his British Association address, Sir William Siemens could enumerate and name a complete set of electrical units, which are still sufficient for our practical wants, all of which even at that early period had been determined with an accuracy much greater than is possible with most physical measurements. So soon as the units had been determined the physicists soon provided convenient instruments for practically measuring electrical quantities in terms of these units."

New Electrical and Mechanical Appliances

Electric Shadow Portrait of William Jennings Bryan.

On October 11, Secretary of State William Jennings Bryan visited the National Conservation Exposition at Knoxville, Tenn. A feature of the decorations at the exposition during the day was an electrical portrait of Mr. Bryan, which was placed on the Van-Wright Inn and attracted considerable attention and comment.

Mr. Bryan, upon expressing his admiration of the likeness and scheme, was presented with the display by Albert Greenwood, president of the Greenwood Advertising Company, and the same was shipped to him for his use at Washington.

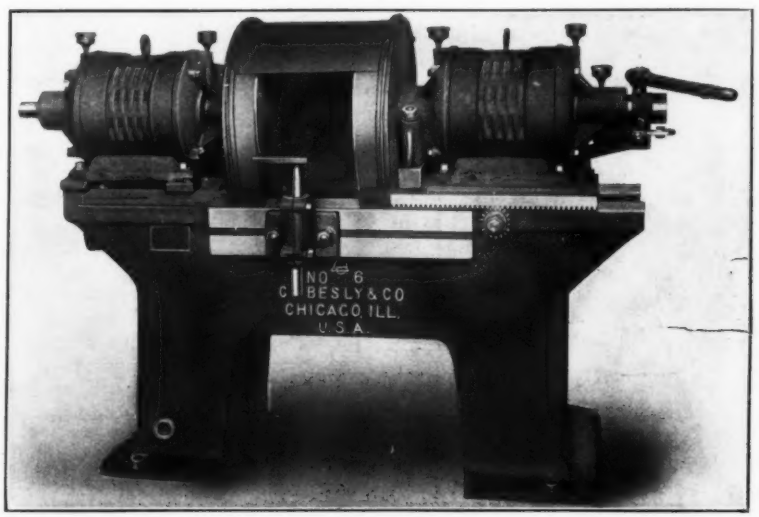
Electric Shadow Portrait.

With this portrait the Greenwood Advertising Company, of Knoxville and Los Angeles, introduces its new line of Greenwood shadow pictures, which are made in various styles and shapes besides making possible the reproduction in electricity of any portrait in a most lifelike way. The high lights and shadows are ingeniously blended, the colors are as natural as in real life and the treatment of the lamps is such as to make them almost invisible.

With the entrance of these shadow pictures of various kinds into the electrical sign industry comes another step forward in the artistic development of electrical displays, not to speak of the great advertising value the same produce for the use of electricity in every form.

A New Double-Spindle Grinder.

A new eighteen-inch disk grinder which possesses a number of interesting features has just been developed by C. H. Besly & Company, Chicago. As clearly shown in the illustration herewith, the machine has two disks for grinding two parallel surfaces simultaneously, each grinding disk being directly mounted on the shaft of a motor. The right-hand motor and its disk can be moved by means of a gear and rack, and clamped at any desired distance within a maximum of 10 inches from the other disk. In order to bring the disks in contact with the work, the shaft and disk of the right-hand motor can be moved forward about one inch by means of the lever shown. A micrometer stop screw, graduated to 0.001 inch, limits this motion so that work can be ground accurately to gauge and duplicated.



Motor-Driven Double-Spindle Grinder.

The dust hood telescopes automatically as the distance between the disks is varied. Ten work rests, varying in size from 0.25 to 5.25 inches in width and suitable for all sizes of work within the capacity of the machine, are regularly furnished. The motors are of the Westinghouse steel-frame induction type with special bearing brackets to carry the unusually large bearings required for grinding service. The capacity of each is 5 horsepower.

Electric Welding for Track Repairs.

There are many methods by which electric welding can be carried out, one of the most interesting being, perhaps, that of Zerener, which consists of a combination of an electric arc and an electromagnetic device whereby the arc can be controlled. Two heavy carbon electrodes are used, and the arc which is struck between them is blown to the position in which it is required by means of the magnet. The most simple is the Bernardos process, which consists of drawing an arc directly between a carbon electrode and the metal which is to be treated. The outfit consists merely of a rheostat for controlling the current, a carbon electrode which consists of a hard, solid carbon rod about 4.5 inches in circumference and 8 or 10 inches long, fitted with a clamp to take the conductor, and with an insulated handle and shield to protect the operator. There is also the Lorain system, which requires a comparatively costly plant, with generator and hydraulic grips, used principally for

making rail joints by welding on splice bars.

An interesting method of building up new metal in the worn parts of tram and other rails by electric welding is now being used, the special feature of the process being that it requires no carbon electrode. The electrode is a rod of specially treated steel, and the arc between it and the rail fuses the electrode and welds it to the steel, building up new metal in the worn or defective places. Current is taken from the trolley wire, and the equipment consists of a light car provided with rheostats for controlling the current and the necessary switchgear. An insulated handle is provided for holding the metal electrode, which is, of course, the positive terminal, the negative being the rail on which the repair is to be carried out. The electrode is placed in momentary contact with the defective portion and withdrawn, an arc being thus formed which carries metal from the positive bar of steel into the faulty place. The action continues as long as the electrode is held in position, and can be stopped at any moment, either by opening a switch or moving the electrode away, so that the arc is broken.

Paragon Cord Holder for Electric Flatirons.

In the use of electric flatirons difficulty is very commonly experienced on account of the cord getting in the way of the material being ironed and also from the cord being bent back and forth so frequently near the point of its attachment to the iron that it soon becomes worn out; sometimes the cord has been allowed to lie upon damp clothes and this has produced short-circuits. To eliminate these difficulties a serviceable cord holder designed particularly for this purpose has been placed on the market by the Paragon Electric Company, 9 South Clinton Street, Chicago.

Fig. 1.—Paragon Cord Holder in Service.

As shown in Fig. 1, the main feature of the holder is a long nickel-plated steel rod, at the upper end of which is a V-shaped hook covered with rubber tubing, by the notch of which the cord is supported. The rod is made in two sections readily joined together and is light but strong. At the lower end it fits into a socket which is pivoted to an inclined arm secured to the top of a clamp for fastening the entire outfit to the ironing board. Beneath this inclined arm is a coiled spring attached to the pivoted socket of the rod in such a way as to tend to hold the rod continually in an upright position.

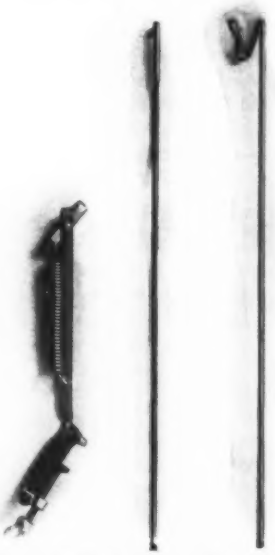


Fig. 2.—Cord Holder Disassembled.

No violent strain is put upon the cord, but a gentle tension sufficient to keep it taut so that it does not dangle along the work or on the board. The clamp can be readily adjusted at either the right or left end of the board so as to accommodate right-handed or left-handed individuals. The cord holder is shipped as a compact three-piece set and will doubtless prove to be a very valuable though inexpensive device.

There are already 34 electric light plants in China, and the number is being steadily increased.

Fireproof Artificial Wood.

A new building material, known as Tekton, which is being introduced in Glasgow, is stated to be of the nature of artificial wood and to possess the strength and durability of concrete. The ingredients of which the material is formed are magnesite, granulated slag, chloride of magnesium, and "wood flour," and its principal properties are that it is porous, has a low heat conductivity, and is soundproof, fire-resisting, odorless, and not liable to develop dry-rot. It is made in boards and planks, or it may be modelled in any required shape. It is claimed to be particularly suitable for use in the construction of portable buildings which have to be erected rapidly and cheaply.

The New Her Boltless Bracket.

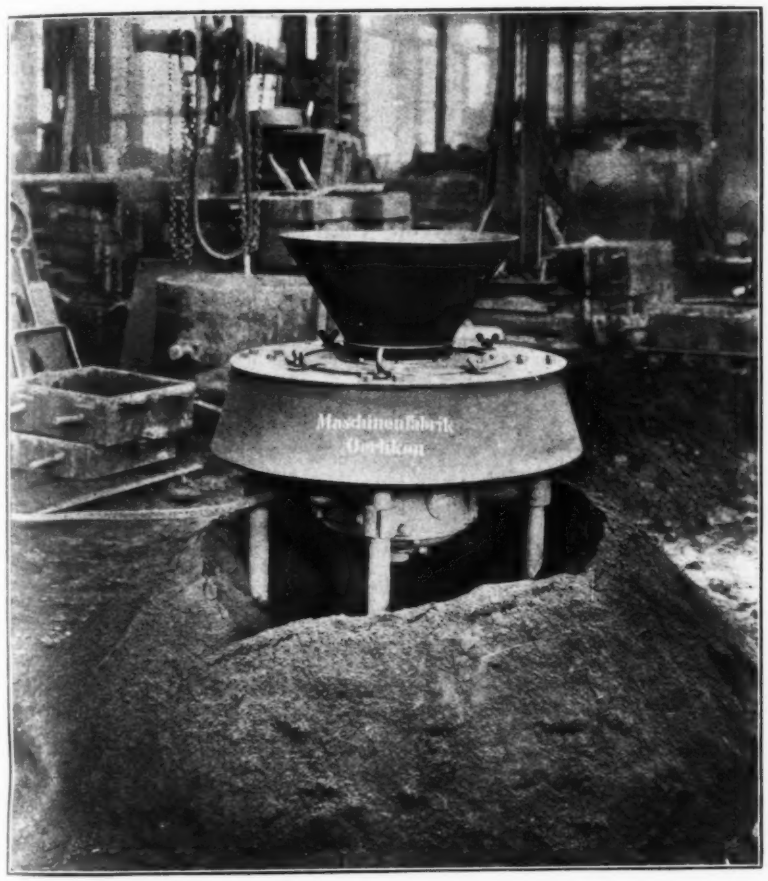
The new patented pole-arm bracket placed on the market by the Line Material Company, South Milwaukee, Wis., and called the Her boltless bracket, is claimed to be the only bracket made without bolts. The accompanying illustration of one type of this bracket shows how the installation is made. The bracket is made of tough malleable iron, heavily galvanized, having a knob on the pivoted arm which is sprung over a slight ridge on the stationary arm. It is very easy to install, is held securely in place and there is no possibility of dropping or losing nuts or of rusting, which usually occurs at the bolt threads. This type of clamp bracket can be used on old or new cross-arms. Old arms can be strengthened and new ones given longer life because no holes are made in the arm as is the case where wood pins are used.

Her Boltless Cross-Arm Bracket.

The first electric steel furnace in Canada was put in operation at Toronto on October 15.

Motor-Driven Foundry-Sand Sifting and Conditioning Machine.

The quality of the sand which is used in foundries for molding work depends not only upon the size and shape of the grains, but especially upon the preparation which the sand has undergone. In fact, the preparation of the sand is a very important feature in giving it the proper plastic qualities and permeability to vapors and gases which are given off during the casting. The sand should have a porous texture and be quite free from lumps as well as from foreign bodies, such as iron wire,



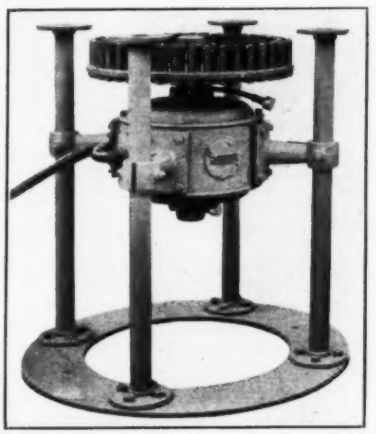
Oerlikon Sand-Conditioning Machine in Use in Foundry.

particles of cast iron and the like, which are generally found in sand that has been frequently used. Heretofore the separation of such impurities as well as the crushing of the lumps has been usually done by sieves of different mesh, together with magnetic separators. But as hand sifting is a long and tedious operation and thus an expensive one, this led to the invention of machines of all kinds for rapid preparation of the sand, these being, however, of large size. Such machines had a high first cost besides a considerable upkeep expense, as frequent repairs were needed.

Illustrated herewith is a compact and cheap machine which is made by the Oerlikon Machine Works, of Oerlikon, near Zurich, Switzerland. This machine has been in use in the company's own foundries for several years. It is of small size and direct driven by an electric motor without belting. It is said to have a good capacity as well as reliability of operation. As shown, the framework has four iron pillars fixed upon a ring-shaped base and upholding the top piece containing the hopper and an outer guard plate of conical shape which prevents scattering of sand. The electric motor is well enclosed and is secured to the pillars by four stout arms. On the motor shaft is fixed a metal disk which carries around near its edge a set of upright metal pins disposed in three rows.

The machine works as follows: The direct-current or alternating-current motor used receives current through a protected flexible cable from any suitable point. After it is started, sand is shoveled into the hopper. The sand is thrown towards the rim of the disk by the action of centrifugal force so that it is driven against the rows of pins and passes through the spaces between them, then striking the outer conical guard and falling to the ground quite freed from its impurities. The particles of iron in the sand collect at the middle of the disk or next the pins, and can be taken out by lifting up the hopper and the small circular plate to which it is attached. It is found that all the lumps are completely crushed and reduced to fine sand by the machine.

It is to be noted that sand which is treated in this way does not need any further sifting and can at once be used for molding work, dispensing with the purchase of expensive molding sands. It is also found that the castings obtained with such porous and plastic sand are both clean and true, being quite free from fins and other external imperfections. This permits doing away with much or even all of the grinding off of such imperfections. The machine can also serve as a sand mixer; all that is needed in this case is to feed the sand into the hopper in the right proportion.



Sand Machine With Hopper, Guard Ring and Apron Removed.

For the present Oerlikon machine there is usually employed a motor of two horsepower size working at a speed of about 960 revolutions per minute. But in quite a number of cases a motor of less power will be sufficient. Motors are furnished for any desired voltage and current. The output of the machine is from 600 to 1,000 pounds of sand per minute; it can keep two or three laborers busy for the feeding. Compared with hand sifting of the sand, the new process is claimed to give 50 per cent economy of labor. The machine is specially useful in small foundries making quantities of standard pieces and where the sand is usually mixed with metal particles in large amount. No foundation is needed to set it up. The total weight of the machine is about 600 pounds and it measures about 4 feet high and 3 feet in diameter.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

BLUE-PRINTING MACHINES AND DRYERS.—The C. F. Pease Company, 166 West Adams Street, Chicago, Ill.

"Pease Peerless" Automatic Printer and Dryer, alternating current, and direct current, 110 volts and 220 volts. The dryer requires 45 to 100 amperes; the arc lamps for the printing machine, 5 to 6 amperes each.

These motor-driven appliances are used in the making of blueprints, by a continuous process, from the light of arc lamps, drying the washed paper with electrically heated bare-wire coils.

These devices should be used only in wiring circuits of suitable capacity for the currents required by the arc lamps, dryer coils and driving motors, and should be approved by the inspection department having jurisdiction.

In other electrical and mechanical details the devices are judged to be suitably constructed and relatively safer than equipments having dryers heated by gas or other fuel.

Approved September 20, 1913.

CONDUIT BOXES.—National Metal Molding Company, Fulton Building, Pittsburgh, Pa.

"National" sherardized pressed-steel boxes.

For rigid conduit, catalog Nos. 2000, 2050, 2060, 2070-2073, inclusive.

Also adapter plate and covers for same for use with metal molding extensions from existing outlet boxes, catalog No. 363.

Approved October 6, 1913.

CONDUIT BOXES, Floor Outlet.—Lutz Webster Engineering Company, Incorporated, Thirty-first Street and Gray's Ferry Road, Philadelphia, Pa.

"Lutz" Floor Outlet Box.

A cast-iron box with brass face plate and nozzle assembled with rubber gaskets and pipe plug for closing unused holes.

Approved September 20, 1913.

DICTATING PHONOGRAPH.—Columbia Phonograph Company, Woolworth Building, New York, N. Y. Distributor for American Graphophone Company, Bridgeport, Conn.

"The Dictaphone" Model 7, for use on 110-volt and 220-volt, direct-current, and 110-volt and 220-volt 25, 40, 60 and 133-cycle alternating-current circuits. The current required is one-fifth to one-fourth ampere. A cast-iron case incloses a special motor which drives a recording and reproducing phonograph mounted on the top of the case. An inclosed adjustable resistance and a special switch are provided as parts of the device.

Approved September 20, 1913.

GROUND CLAMPS.—Robert R. Forbes, Submittor, Mt. Holly, N. J. Cleverly Electrical Works, Manufacturer, 17-19 North Seventh Street, Philadelphia, Pa.

"Forbes" Ground Clamp, consisting of a two-piece copper strap provided with a stove bolt. One end of the strap is designed to facilitate the soldering of the ground wire to the clamp. This clamp is adjustable for use on one-half, three-fourths and one-inch pipes.

Approved September 20, 1913.

PANELBOARDS.—Starrett Electric Company, 831 Washington Street, Michigan City, Ind.

Approved September 26, 1913.

RECEPTACLES, Standard.—National Metal Molding Company, Pittsburgh, Pa.

For use with "National" metal molding.

Push button, 250 watts, 250 volts, catalog No. 358.

Keyless 660 watts, 250 volts, catalog No. 356.

Approved October 6, 1913.

RECTIFIERS.—Thomas A. Edison, Incorporated, Orange, N. J.

"Edison" Alternating-Current Rectifiers, Types B-2 and B-4, for use on 60-cycle, 110-volt or 220-volt circuits, for charging ignition batteries.

Each of these devices consists of a transformer and an arrangement of vibrator units with an inclosing case. The full-load input is less than 660 watts.

Note: This rectifier and its rheostat in normal operation are capable of producing arcs which may, under certain conditions, ignite inflammable vapors. They should preferably, therefore, be placed outside of rooms liable to contain such vapors, or if in such rooms must be installed in compliance with the requirements of the inspection department having jurisdiction.

Approved September 10, 1913.

RHEOSTATS.—Allis-Chalmers Manufacturing Company (Works of the Bullock Electric Manufacturing Company), Norwood, O.

"A. N. Y." Induction Motor-Starting Rheostats, 50 to 700 amperes.

"A. N. Y." Induction Motor-Speed Regulators, 50 to 700 amperes.

Approved September 12, 1913.

SIGNS, Electric.—Century Advertising & Manufacturing Company, Lancaster, Pa.

Approved September 5, 1913.

SIGNS, Electric.—Koken Barbers' Supply Company, 2528 Texas Avenue, St. Louis, Mo.

Electrically illuminated revolving barber pole; 125 volts, one ampere per circuit.

This device consists of a clock mechanism arranged to rotate a cylindrical sign and a disk of porcelain carrying contacts connecting through brushes to three incandescent lamps. The entire operating mechanism is inclosed in a cast-iron case located below the revolving cylindrical sign.

Approved September 12, 1913.

SIGNS, Electric.—George H. Rice Company, 481-487 Sterling Place, Brooklyn, N. Y.

Approved September 16, 1913.

SWITCHES, Combination Cutout.—Gold Car Heating & Lighting Company, 17 Battery Place, New York, N. Y.

Two single-pole switches with single-pole cartridge-fuse extension mounted on a slate base and inclosed by a cast-iron cabinet; 30 amperes, 600 volts.

This device is used for controlling car heaters.

Approved September 25, 1913.

SWITCHES, Knife.—Fort Wayne Electric Works of General Electric Company, Fort Wayne, Ind.

Interconnected switch and Lunkenheimer valve for control of motor-operated pumps for water supply.

Two-pole, 60-ampere, 250-volt, one-half and three-fourths-inch valves.

These devices are rated standard as being in compliance with requirements of the National Electrical Code. This rating is to be understood as indicating that in their construction the electrical fire hazard has been reduced to an acceptable degree. It is not to be construed as an approval of the devices for use in connection with automatic sprinkler or similar fire protective equipments, for which services their merits have not been investigated.

Approved October 4, 1913.

SWITCHES, Pendent Snap.—Chapman & Walker, Limited, Submittors, 65-69 Victoria Street, Toronto, Canada. Manufactured for the above by Sterling Telephone & Electric Company, 200 Upper Thames Road, London, England.

The following switches are approved and labeled under conditions stated on card of previous issue.

(Brass Shell.)

Single pole, 3 amperes, 250 volts, 6 amperes, 125 volts, catalog No. A-405.

Approved September 24, 1913.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

EDGEWOOD, IOWA.—Bonds for $12,000 have been voted for an electric light plant. C.

SLAYTON, MINN.—An agitation has been started by the Slayton Herald for electric lights. C.

GALLUP, N. M.—The Peoples Light & Power Company has been granted a franchise in this city.

RIVERSIDE, N. J.—The Public Service Corporation will build a new sub-station on Monroe Street. A.

GLIDDEN, IOWA.—The Council will establish a municipal lighting plant. Address the city clerk for information.

GARNETT, KANS.—$15,000 in bonds will be expended for an electric-light plant. Address the city clerk for particulars.

BATTLE CREEK, IOWA.—A franchise has been granted to Charles E. Churchill for a new light, heat and power plant.

STERLING, ILL.—A committee has been appointed to secure funds for boulevard lighting. Address R. A. Kidder for information.

WILKESON, WASH.—The Wilkeson Light, Fuel & Power Company has been organized here. A light and water plant will be established.

BORDENTOWN, N. J.—The Public Service Electric Company will build a new substation on Burlington Street to cost about $30,000. A.

NEWARK, N. J.—The Diehl Manufacturing Company will build a new one-story power plant at Frelinghuysen Avenue and Virginia Street. A.

WHITE SULPHUR SPRINGS, W. VA.—Allegheny Power Company has been incorporated with a capital stock of $25,000 to develop water power.

ELECTRA, TEX.—The power plant of the Electra Electric Company was recently destroyed by fire, after having been in operation only a few months.

HARRISON, N. J.—The Hyatt Roller Bearing Company will build a new power plant for the operation of its manufacturing plant, on Somerset Street.

GERLED, IOWA.—There is a movement on foot to build an electric light plant here and furnish electricity for Mancroft, Swea City, Ledyard and Germania. C.

KENOSHA, WIS.—A "White Way" lighting system will be installed in the business district. C. H. Goodman and A. J. Walsh compose the committee in charge. C.

LAFAYETTE, ORE.—The Yamhill Electric Company has announced its intention of extending its line from this city to Carlton and of serving that community.

AVA, MO.—Ava Electric Light Company of Ava has been incorporated, capitalized at $6,000. The incorporators are H. S. Wilson, J. W. Pettit and Joseph H. Hawkins.

JERSEY CITY, N. J.—The Street Department will install 50 new street lamps on Newark Avenue to form a "White Way" district. James J. Ferris is director of streets. A.

BATAVIA, ILL.—The Batavia Commercial Club is planning to extend its ornamental lighting system across the Island to Batavia Avenue before the holiday season. Z.

PORT CLINTON, O.—E. E. Seidel of Cleveland is preparing estimates for a municipal light plant. The question of issuing bonds will be submitted to a vote in November.

HARLEM, MONT.—A. J. Jaqueth, of the Jaqueth Engineering Company, Kalispel, has been engaged to draw plans for a power plant and street lighting system for this place. C.

GILBERTVILLE, IOWA.—The Gilbertville Lighting Company has been incorporated with a capital stock of $2,500 to furnish electricity and gas for lighting. R. W. Allen is president.

MANITO, ILL.—Plans for the new electric light plant for this village have been agreed upon and the blueprint of the structure is now being made. Reeves and Baillie, of Peoria, are the architects.

CLAY, KY.—The Clay Light & Ice Company has disposed of a bond issue and will use the proceeds for the purpose of enlarging its ice factory and adding equipment for operating an electric light system. G.

LEITCHFIELD, KY.—The plant of the Leitchfield Electric Light, Heat & Power Company was totally destroyed by fire October 23. The loss was about $15,000. The company will proceed to rebuild at once. G.

LUVERNE, MINN.—A "White Way" lighting system will be installed on both sides of Main Street. L. G. Couter is representing L. P. Wolf, consulting engineer, St. Paul, who will make surveys, plans and specifications. C.

ALBIA, IOWA.—Failing to renew the street-lighting contract with the Albia interurban the City Council will go ahead with plans for a municipal light plant. The old contract which has run for five years expires next month.

SEATTLE, WASH.—The city engineer has been instructed to prepare plans and specifications for the installation of a system of cluster lighting on a number of streets, the cost of which will be assessed against property owners.

MULBERRY GROVE, ILL.—The Southern Illinois Light & Power Company of Hillsboro, Ill., has been granted a 50-year franchise by the Village Board to sell light and power in the village and has been awarded a 10-year contract to light the village streets. Z.

ROCKVILLE CENTRE, N. Y.—Plans are being completed for the improvement of the municipal electric-light and water plant at Rockville Centre. H. Major, chief engineer of the village, has recommended the installation of another boiler to increase the capacity of the power plant.

ELMWOOD, ILL.—E. O. Brown, of Elmwood, has purchased the plant of the Cambridge Light & Power Company at Cambridge and has been granted a 20-year franchise by the Cambridge Village Board to sell light and power there. It is reported that power will be supplied to several towns.

NATCHEZ, MISS.—At a special meeting of the Board of Aldermen it was ordered that the Light and Water Committee be instructed to advertise for bids for the public lighting of the city of Natchez from the expiration of the present contract in March. The bids will be received December 3. Address Clerk of the Board of Aldermen.

SPRINGFIELD, W. VA.—The Magnolia Power Company proposes to construct a hydroelectric plant, developing 13,000 horsepower, on the south branch of the Potomac here. The cost will be $1,000,000. It is proposed to transmit electricity to Cumberland, Springfield, and near-by points. Mr. F. E. Brackett, of Cumberland, is engineer in charge.

ASHLAND, ORE.—City Electrician Butterfield recently made formal application to the City Council asking that the proposition of voting $25,000 in bonds to build an auxiliary electric light plant be placed before the voters at the coming city election. He estimates that $16,000 should be expended in the plant proper, and the balance be used in extensions of electric-light lines, etc. O.

OLYMPIA, WASH.—Millard Lemon and Wilbur B. Forshay, principal owners of the Washington Public Service Corporation, recently filed an application for a franchise with the Thurston County Commissioners to construct a pole line for the transmission of electric light and power from Olympia to Tenino, thence to Grand Mound, and back through Rochester to Gate. This Company is erecting a power plant on the waterfront here.

FARMINGTON, ME.—The Franklin Light & Power Company has been incorporated with a capitalization of $750,000. The purposes of the new corporation are to purchase, lease, acquire and own real estate and personal property and to purchase, lease, acquire and own water powers and privileges and develop the same; to purchase, acquire and own stock and bonds in other corporations; to sell, lease and dispose of real estate, personal property and water powers and privileges and stocks and bonds of other corporations. A. L. Fenderson of Farmington is president; C. O. Sturtevant, of Farmington treasurer; C. L. Sturtevant, of Farmington, clerk.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

PRESTON, MINN.—Standard Telephone Company will improve the exchange and rebuild the local system. C.

BLYTHE, CAL.—A franchise for a telephone and telegraph system in this city has been granted to S. D. Kamran.

HOGUE, KY.—The Big George Telephone Company has been incorporated by George Adams and Adam Dick, of Hogue.

SPOKANE, WASH.—John Hansen, Davenport, Wash., will build a telephone line from Greenwood to this city this fall. O.

OVERLY, N. D.—Fred Sims is promoting the organization of a Farmers telephone company in the eastern part of Bottineau County. C.

MARLIN, TEX.—The Falls County Telephone Company is constructing lines to Odda and Big Hill and will extend its rural lines on to Groesbeck. D.

PRESCOTT, IOWA.—The Prescott Mutual Telephone Company has been incorporated with a capital stock of $9,900. W. D. James is president.

CAMP COOK, S. D.—Jacob Ridway has bought the telephone exchange, including switchboard, phones, poles, wires, etc., and will make a number of improvements.

PHOENIX, ARIZ.—The Mountain States Telephone & Telegraph Co. is preparing plans for rebuilding its system in the valley and for extensions in the city.

PORT ANGELES, WASH.—The Angeles Telephone & Telegraph Company will spend $40,000 for an exchange building and improvements in the local system. C.

HOMER, NEB.—The Blyburg Telephone Company has been organized and E. A. Bakke elected president; Herman Hurley, secretary. The line will be built at once. C.

EAST ORANGE, N. J.—The City Council is contemplating the removal of poles recently erected for a police signal system, and planning to install underground lines. A.

HAMPTON, S. C.—The Citizens Telephone Company, has been incorporated with a capital stock of $10,000 to conduct a general telephone business. W. A. McDaniel is president.

HAMBURG, IOWA.—The City Council has ordered that the telephone and electric light companies remove their poles from Main Street for a distance of five blocks. Address the city clerk.

SANDY, ORE.—The City Council recently granted franchises to the Firwood-Dover and the Gresham Telephone Companies to erect poles and operate a telephone system in the city of Sandy. O.

VIENNA, MO.—Maries County Independent Telephone Company of Vienna has been incorporated with a capital stock of $5,000. The incorporators are George E. Chandler, H. E. Calvert and J. H. Chrisman.

SAN DIEGO, CAL.—The San Diego Home Telephone Company, has applied to the Commission for permission to issue notes in the sum of $150,000, part of which will be used for making additions and betterments to its system.

BERLIN, OKLA.—Berlin Phone Company of Berlin has been incorporated, capitalized at $1,500. The incorporators are W. H. Jencks, E. S. Repass, of Grimes; J. H. Smith, V. S. Watson, N. B. Winters and H. Caldwell, of Berlin.

PORTLAND, ORE.—The Pacific Telephone & Telegraph Company has made an appropriation of $55,000 to meet the cost of a conduit on Oak Street, and of $60,000 for the rebuilding of 23 miles of lead between Salem and Aurora Junction.

OKLAHOMA CITY, OKLA.—An Oklahoma charter has been issued to the Wilson Telephone Company of Wapanucka, with a capital of $500. The incorporators are T. C. Wallace, F. D. Lail and I. W. Dunning, all of Wapanucka.

VANCOUVER, B. C.—J. P. Phelan, Superintendent of Telegraphs of the Canadian Government, here, states that work will start at once on the proposed telephone line to be built from Clayquot to Friendly Cove on the west coast of Vancouver Island. O.

ELECTRIC RAILWAYS.

(Special Correspondence.)

PELLA, IOWA.—Business men are raising funds for an electric line to Howell. Engineer Blank of Waterloo has charge of the project. C.

MORRIS, ILL.—The City Council has granted a 50-year franchise to the Fox & Illinois Union Railroad Company to operate an interurban line over streets of the city. Z.

KEYSTONE, W. VA.—The Elkhorn Valley Traction Company has been chartered with a capital stock of $100,000 to build a line five miles long. The company has a franchise in Clark as well as this place.

ORTLEY, ORE.—Col. Cornelius Gardner will build an electric tramway from Ortley to Rowena, which will cost in the neighborhood of $25,000. The right of way has been purchased, and work will commence in the immediate future. O.

DANVILLE, ILL.—A committee has been appointed to promote the building of an interurban line between Danville and Kankakee. The proposed road was incorporated three years ago as the Kankakee, Crescent City and Danville. C. U. Feldkamp, and C. L. English are the promoters.

OTTAWA, ONT.—Dominion letters patent incorporating the Ottawa Traction Company, Limited, capitalized at $10,000,000, with head offices here, have been issued by the Secretary of State. The corporation is granted wide powers in connection with the development and distribution of electrical power, but nothing in its charter indicates that the company purposes engaging in the traction business.

ISMAY, MONT.—The Ismay Ekalaka & Southern Electric Railway & Power Company was recently organized and incorporated here. William Fulton is president; George J. Murphy, secretary-treasurer; and M. H. Heldman, C. O. Wright, H. M. Sikes, compose the Executive Committee. The company purposes building electric railroad lines throughout this section. Construction work to begin shortly.

MADISON, WIS.—The Chicago & Wisconsin Valley Railroad is preparing to construct an interurban line from Madison to Janesville and from Janesville to Portage. Local cars are already running in Portage and work is under construction in Madison. The total length of the line will be 254 miles. The president of the company is J. E. Jones, 435 Washington Building, Madison.

NEW INCORPORATIONS.

TOLT, WASH.—Tolt Water, Light & Power Company has been incorporated with a capital stock of $70,000 by R. B. McAdams, and Robert McMurchie.

MILWAUKEE, WIS.—Honey Creek Electric Company has geen incorporated with a capitalization of $4,000 by H. B. Miller, E. F. Healey and L. L. McDonald.

TACOMA, WASH.—The Electric Fixture Company recently filed articles of incorporation with a capitalization of $10,000. R. F. Gleason and J. G. Parkhurst are trustees. O.

VELASCO, TEX.—Velasco Gin & Power Company has been incorporated with a capital stock of $7,500. The incorporators are D. T. Austin, H. A. Hall, and J. W. Moore, all of Velasco.

TOMPKINSVILLE, KY.—Tompkinsville Electric Light & Ice Company has been incorporated with a capital stock of $2,000 by John Brown, Belle Brown and Ollie Brown, of this city.

NEW HAVEN, CONN.—The Stevens-Fitch Company has been incorporated with a capital stock of $50,000. The incorporators are E. L. Stevens, Nathan B. Fitch and Ralph H. Clark.

NEWARK, N. J.—Electrical Specialties Company has been incorporated with a capitalization of $100,000. The incorporators are M. Mazzolla, of Kearney; G. C. Tramer and H. C. Tramer, of Newark.

KIEFER, OKLA.—The Kiefer Light & Ice Company has been chartered with $20,000 capital stock. The incorporators are Charles H. Shone and Charles E. Petty, of Kiefer, and D. W. Franchot, of Tulsa.

WEBSTER CITY, IOWA.—Papers of incorporation have been received by the International Telephone Meter Company. The authorized capital stock is $1,000,000 and E. H. Martin, president of the Martin Telephone Company, is named as the principal incorporator.

CLEVELAND, O.—The E. S. Parsons Electric Company has been incorporated with a capital stock of $10,000 for the purpose of engaging in electrical construction. The incorporators are E. E. Parsons, J. R. Frost, J. W. Abel, F. L. Schneider and Frank Lewis.

NEW YORK, N. Y.—The Lighting Corporation has been incorporated with a capital stock of $10,000 to deal in gas and electric lamp fixtures, supplies, etc. The incorporators are William B. Walsh, Brooklyn, N. Y.; William L. Glenn, New York City; and Emory S. Lewis, Llushing, N. Y.

NEW YORK, N. Y.—Oxford Gas & Electric Supply Company, Incorporated, has been granted articles of incorporation to deal in gas and electric fixtures, etc. The capital stock of the company is $1,000 and the incorporators are Samuel Hoffman, David Eisenstat and Louis Schafer, all of New York City.

BUFFALO, N. Y.—Auto Electric Equipment Company, Incorporated, has been incorporated with a capital stock of $15,000 for the purpose of manufacturing electric generating machinery and appliances. The incorporators are Edward W. Werick, Charles H. Werick and Fred C. Schoenthal, of Buffalo, N. Y.

FOREIGN TRADE OPPORTUNITY.

(Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C. In applying for addresses refer to file number.)

NO. 11,878.—ELECTRICAL SUPPLIES.—An American consular office in a European country reports that a business man in his district is desirous of obtaining the agency of American manufacturers of electrical supplies of all descriptions. This person also states that he is open to purchase considerable quantities of such supplies if American manufacturers will get in touch with him and supply catalogs, prices, etc.

FINANCIAL NOTES.

A decision on the appeal, taken by the New York Edison Company from the decision of the Appellate Division of the Supreme Court on the writ of certiorari for review of the order of the Public Service Commission of New York, granting the Long Acre Electric Light & Power Company permission to issue $4,000,000 in bonds, $2,000,000 in capital stock, and to proceed with the construction of a plant for production of electric light and power, is expected late in November. Ninety-eight per cent of the outstanding bonds of the Long Acre Electric Light & Power Company are in the possession of the interests of the late Anthony N. Brady and associates. Foreclosure proceedings on the $500,000 of four per cent coupon bonds were dismissed last August by Supreme Justice Greenbaum who had the Long Acre Company deposit $100,000, the amount of the back interest, with the City Chamberlain. The long Acre Company had tendered the full amount of the back interest, but it was refused by the majority holders of the outstanding bonds. While the Brady interests have not so far appealed from Justice Greenbaum's decision, this opportunity is open to them. They might also institute new foreclosure proceedings through the mediary of the Metropolitan Trust Company, the holders of the bonds. Those closely in touch with the situation expect that new foreclosure proceedings will be instituted. If these legal difficulties were removed the Long Acre Company might become a competitor of the New York Edison Company. The former has $500,000 bonds outstanding and $50,000 stock, of which $49,000 stock was formerly held by the Manhattan Transit Company, and is now held by the Intercity Power Company formed to develop the Long Acre Company. The Long Acre Company's fixed capital approximates $100,000 and its investments have a book value of $500,000, Current liabilities and interest exceed $400,000. Its deficit approximates $400,000, as total liabilities approximate $1,000,000. New York Edison Company has a surplus of $28,800,000; investments with book value of $14,400,000, and plant and property in excess of $125,000,000. Its funded debt amounts to $44,000,000. It has $50,153,400 capital stock outstanding, all owned by the Consolidated Gas Company. The Edison Company will have $66,000,000 outstanding stock, all owned by the Consolidated Gas, as soon as authority for the issuance of $15,800,000 new stock is given by the New York Public Service Commission.

The Ontario Power Company of Niagara Falls has applied to the New York Stock Exchange to list an additional $1,203,000 of first-mortgage five-per-cent bonds, due 1943.

Directors of the Commonwealth Edison Company, of Chicago, have announced an issue of 10 per cent in new stock for subscription at par by stockholders of record November 15. Payments are to be made in installments of 25 per cent each on the following dates: December 1, February 2, May 1 and August 1.

The Guaranty Trust Company, of New York, has made the following announcement: "The entire issue of Interborough Rapid Transit Company 45-year five-per-cent bonds will be redeemed at the Trust Department of the Guaranty Trust Company at 105 and accrued interest on and after November 1. Holders of bonds should deliver them unfolded with the November 1 coupon attached and in numerical sequence to facilitate payment. Holders desiring to deposit bonds redeemable November 1 previous to that date may do so."

At a special meeting of the Pennsylvania Central Light & Power Company stockholders it was voted to increase the company's indebtedness from $5,000,000 to $7,500,000. The money derived therefrom will be used for betterments to the company's property.

The following securities have been listed on the New York Stock Exchange: Brooklyn Rapid Transit, $39,999,000 six-year five-per-cent secured coupon notes, with authority to add $20,000 prior to July 1, 1914, on notice that they have been sold, making the total authorized to be listed $59,999,000.

H. M. Byllesby & Company, and the Continental & Commercial Trust & Savings Company, of Chicago, are offering $950,000 of Standard Gas & Electric collateral trust six-per-cent notes, being the unsold portion of the $3,000,000 of these notes authorized last June. Of these notes $2,650,000 were offered at that time, the remaining $350,000, which are now included in the present offering, being reserved for future sale. Earnings of the company for the 12 months ended August 31, 1913, applicable to payment of interest on these notes were $1,390,993, which after providing for the $180,000 note interest, would leave a balance of $1,210,993 applicable to the stocks of the company.

The special meeting of the stockholders of the Electric Light & Power Company, of Abington and Rockland, Mass., called for November 7, is for the purpose of increasing the capital stock of the corporation by the issue of 472 shares of stock to be sold to stockholders in the ratio of one share of the new stock to each four shares of the old at a price to be approved by the gas and electric light commissioners. At present the company has a floating debt of $65,000 and incurred for additions and improvements to plant and also for the retirement of $20,000 of bonds of the Cohasset Electric Company assumed by the Electric Light & Power Company, which matured January 1, 1913. It is to provide funds for the retirement of this floating debt that the new stock is to be issued.

The special meeting of the stockholders of the Puget Sound Traction, Light & Power Company, called for November 3, is for the purpose of authorizing an increase in the preferred stock of the company of $2,686,200. Puget Sound Traction, Light & Power at present has preferred stock outstanding, including $1,106,800 of non-interest-bearing preferred receipts exchangeable into preferred stock of $12,045,600. In addition it has outstanding common stock, including receipts exchangeable for common stock, of $21,644,600. The directors state that in order to provide for the financing of extensions, additions and improvements to the property necessitated by the demands of growing business and also for the refinancing of the $7,500,000 two-year five-per-cent notes due February 1, 1914 they are of the opinion that a portion at least of the funds necessary for these purposes should be obtained by the sale of preferred stock. In case the issuance of the new stock is authorized, the holders of each eleven shares of stock of the company, either common or preferred, will be entitled to subscribe at par for one share of the new preferred stock. The preferred stock is now quoted at between 95 and par. Earnings of the company are showing fair increases and for the 12 months ended August 31, 1913, gross earnings were 8,400,734, with net earnings of $3,497,605 and surplus after all charges of $1,462,207.

Dividends.

American Railway Company, quarterly of 1.75 per cent on preferred, payable November 15 to stock of record October 31.

Colorado Power Company; initial, at the rate of seven per cent a year on preferred for period from April 15 to November 30, payable December 15 to stock of record November 30.

Easton Consolidated Electric Company; regular semi-annual of two per cent, payable November 3 to stock of record October 23.

Illuminating & Power Securities Company; quarterly of 1.75 per cent on preferred, payable November 15 to stock of record October 31.

Kaministiqua Power Company; 1.75 per cent, payable November 15 to stock of record October 25.

Kellogg Switchboard & Supply Company; quarterly of three per cent, payable November 3 to stock of record October 31.

Lowell Electric Light Corporation; a quarterly dividend of $9 a share on its capital stock, payable November 1 to stock of record October 24.

Montana Power Company; quarterly of 2.5 per cent, payable November 15 to stock of record October 31.

Pensacola Electric Company; the regular semi-annual dividend of $3 a share on its preferred stock, payable December 1 to stock of record November 15.

Tampa Electric Company; the regular quarterly dividend of $2.50 a share on its capital stock payable November 15 to stock of record of November 1.

Southern California Edison Company; a quarterly common dividend of 1.5% per cent, payable November 16 to stock of record October 31.

Reports of Earnings.

AURORA, ELGIN & CHICAGO.

The report of the Aurora, Elgin & Chicago for the year ended June 30, 1913, compares as follows:

	1913.	1912.
Gross	$2,014,843	$1,900,628
Net after taxes	776,202	788,135
Charges	395,223	427,383
Surplus	380,978	360,752
Dividends	279,000	279,000
Balance	101,978	81,752

CONSTRUCTION CITIES LIGHT, POWER & TRACTION COMPANY.

	September	Nine Mos.
Gross	$50,580	$591,034
Net	49,367	579,959
Balance after charges	16,602	302,401
Surplus after dividends	5,768	204,901

NORTHERN STATES POWER COMPANY.

The Northern States Power Company reports earnings for the year ended August 31, 1913, as follows:

Northern States Power Co.

	1913	1912
Gross earnings	$3,794,884	$3,414,733
Net after taxes	1,925,852	1,700,348

Surplus after charges $733,490; balance after preferred dividends, $ 73,643. Equivalent to 2.9 per cent on outstanding common stock.

CITIES SERVICE COMPANY.

The report of the Cities Service Company for the year ended September 30, 1913, shows net earnings of $1,459,652, an increase of $389,996. The income account for September and the twelve months compares as follows:

	1913	Changes
September gross	$ 147,696	Inc. $ 50,372
Net	122,914	Inc. 31,119
Preferred dividends	63,552	Inc. 12,568
Common dividends	33,569	Inc. 15,247
Surplus	25,793	Inc. 3,274
Twelve months gross	1,591,064	Inc. 438,812
Net	1,459,652	Inc. 389,996
Preferred dividends	724,468	Inc. 137,536
Common dividends	356,858	Inc. 156,003
Surplus	378,324	Inc. 96,456

KEYSTONE TELEPHONE.

The Keystone Telephone Company's statement of earnings for the month of September and the nine months ending September 30 follows:

	1913	1912
September gross	$107,310	$102,039
Net after taxes	52,496	51,139
Surp. after charges	26,312	25,881
Nine months' gross	944,417	901,818
Net after taxes	465,112	447,548
Surp. after charges	236,146	221,250

EDISON COMPANY OF BOSTON.

The annual report of the Edison Company of Boston, for the year ended June 30, 19 3, shows net earnings available for dividends of $2,557,949 equivalent to 14 per cent on the 182,000 shares now outstanding.

Earnings for the past two years compare as follows:

	1913	1912
Gross	$6,365,874	$5,787,344
Expenses	2,724,198	2,371,563
Net from operating	3,641,675	3,415,780
Miscellaneous profits	103,956	74,969
Total	3,745,632	3,490,750
Taxes	797,617	780,000
Net earnings	2,948,014	2,710,750
Interest	390,065	242,859
Dividends	1,950,333	1,872,444
Surplus	607,616	595,446

SOUTHERN CALIFORNIA EDISON.

	1913	1912
August gross	$ 417,355	$ 366,055
Net after taxes	198,399	147,353
Surplus after charges	125,696	87,112
Balance after preferred dividends	109,029	70,445
Eight months' gross	3,105,429	2,803,637
Net after taxes	1,551,913	1,325,144
Surplus after charges	1,007,806	858,151
Balance after preferred dividends	874,570	724,915

The balance after preferred dividends for the eight months available for depreciation charges and dividends on the common stock of $8,400,000 is at the annual rate of 15.6 per cent on the outstanding issue.

SOUTHWESTERN POWER & LIGHT CO.

The Southwestern Power & Light Company reports consolidated earnings of subsidiary companies for September, three months ended Sept. 30, and twelve months ended Sept. 30:

	1913.	1912.
September gross	$ 192,659	$ 167,387
Net after taxes	89,125	68,798
Three months' gross	551,677	486,826
Net after taxes	256,443	203,471
Twelve months' gross	2,152,126	1,845,920
Net after taxes	966,645	820,752

LAKE SHORE ELECTRIC RAILWAY.

	1913	1912
August gross	$163,244	$147,887
Net after taxes	87,026	75,108
Surplus after charges	51,715	39,920
Eight months gross	942,467	872,777
Net after taxes	383,703	372,562
Surplus after charges	102,711	93,313

GREAT WESTERN POWER.

	September.	Nine Months.
Gross earnings	$223,330	$1,993,094
Net after gross	149,189	1,444,564
Surplus after charges	50,422	582,985

Surplus for the nine months is an increase of $289,810 over that for the nine months ended September 30, 1912.

EASTERN PENNSYLVANIA RAILWAY COMPANY.

The Eastern Pennsylvania Railway Company reports earning for the fiscal year ended June 30, 1913, as follows:

	1913	1912
Gross earnings	**$769,680**	**$699,306**
Net after taxes	**333,676**	**260,713**
Surplus after charges	118,373	46,467

WESTERN UNION TELEGRAPH COMPANY.

The Western Union Telegraph Company has issued its estimated statement of earnings for the quarter ended September 30, 1913.

	1913	1912
Gross income	$12,085,000	$11,598,762
*Expenses	10,970,620	10,484,762
Net revenue	1,114,380	1,114,000
Bond interest	334,310	334,295
Balance	780,070	779,705
Dividends	748,070	748,020
Surplus	32,000	31,685

*Includes rent of leased lines, current maintenance, depreciation and taxes.

The company has also issued a more detailed statement, covering the eight months ended August 31, 1913, which we show as follows:

	1913	1912
Gross earnings	$29,984,739	$28,409,832
*Operating expenses	22,464,274	21,057,732
Maintenance	2,411,892	2,375,341
Depr. & reconstruction	1,996,933	1,954,933
Taxes	765,000	628,414
Total expenses	27,636,099	26,016,420
Balance	2,348,639	2,393,412
†Income	626,260	731,624
Total income	2,974,900	3,125,035
Interest	891,486	1,024,798
Surplus	2,083,414	2,100,238
Dividends	1,994,825	1,994,668
Surplus	88,590	105,570

*Including rent of leased lines.
†From loans and investments, including rentals from real estate.

AMERICAN TELEPHONE.

The American Telephone & Telegraph Company reports total earnings for the nine months ended September 30, 1913, of $34,199,981, an increase of $2,926,121, and a surplus after dividends of $4,081,292, a decrease of $194,466, as compared with the same period a year ago. Following is the comparative statement for the period named:

	1913	Increase
Dividends	$19,152,982	$1,482,849
Int. and other revenue from associated companies	10,040,940	762,160
Telephone traf. (net) A.	4,276,617	262,699
Other sources	529,442	218,412
Total	$34,199,981	*2,926,121
Net	30,349,621	2,567,427
Balance	24,643,264	1,046,675
Dividends paid	20,561,972	1,241,141
Balance	$ 4,081,292	*$194,466

*Decrease.

The Bell Telephone system in the United States reports for the eight months ended August 31:

	1913	Increase
Gross	$141,963,035	$12,347,960
Total expenses	102,854,840	10,619,603
Net	$ 39,108,195	$ 1,728,357
Balance net profit	28,114,185	*192,578
Surplus	$ 7,924,557	*952,789

*Decrease.

UTAH POWER & LIGHT.

	1913.	1912.
September gross	$ 148,568	$ 125,591
Net after taxes	90,948	69,411
Twelve months' gross	1,614,525	1,504,597
Net after taxes	937,829	819,601

MASSACHUSETTS LIGHTING COMPANIES.

	1913.	1912.
September sales	$ 91,406	$ 87,399
Three months' sales	250,960	236,386

MOUNT WHITNEY POWER COMPANY.

The report of the Mount Whitney Power & Electric Company for the year ended August 31, 1913, shows net earnings of $277,937, against $226,664 the previous year. The income account for August and the fiscal year compares as follows:

	1913	Increase
August, gross	$ 54,028	$14,266
Net after taxes	29,500	12,053
Surplus after charges	19,625	10,053
Twelve months' gross	519,287	89,649
Net after taxes	277,937	51,273
Surplus after charges	159,437	27,273

DETROIT UNITED RAILWAY.

	1913	1912
August gross	$1,186,358	$1,103,504
Net	389,172	370,478
Other income	24,740	17,371
Total income	413,912	387,849
Charges and taxes	179,841	176,499
Surplus	234,071	211,350
8 months' gross	8,672,284	7,601,892
Net	2,855,589	2,640,255
Other income	162,244	134,981
Total income	3,017,833	2,775,236
Charges and taxes	1,437,392	1,418,827
Surplus	1,580,441	1,356,409

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Oct. 27.	Oct. 20.
American Tel. & Tel. (New York)	121¾	121
Commonwealth Edison (Chicago)	135	142
Edison Electric Illuminating (Boston)	263	262
Electric Storage Battery common (Philadelphia)	47¼	46
Electric Storage Battery preferred (Philadelphia)	47¼	46
General Electric (New York)	140⅜	140¼
Kings County Electric (New York)	119	119
Manhattan Transit (New York)	1¼	1½
Massachusetts Electric common (Boston)	11	12
Massachusetts Electric preferred (Boston)	67	67
National Carbon common (Chicago)	132½	126
National Carbon preferred (Chicago)	113	115
New England Telephone (Boston)	140	139
Philadelphia Electric (Philadelphia)	22⅜	22⅜
Postal Telegraph and Cables common (New York)	77	77½
Postal Telegraph and Cables preferred (New York)	63	65
Western Union (New York)	62½	60½
Westinghouse common (New York)	65	64⅜
Westinghouse preferred (New York)	110	110

PERSONAL MENTION.

MR. OTTO ROBERT SCHURIG has been appointed instructor in electrical engineering at the Massachusetts Institute of Technology.

MR. THOMAS N. McCARTER, president of the Public Service Electric Company, gave an address to several hundred employees of the company at a meeting at Newark, N. J., of the company section of the National Electric Light Association on the evening of October 20. Mr. McCarter spoke of the growth of the company from its infancy to the present time.

MR. L. A. HAWKINS, of the Research Laboratory of the General Electric Company, delivered a very interesting address on the "Place of America in Scientific Research Work," before the New York Electrical Society on the evening of October 23. Amongst the apparatus used to illustrate the remarkable progress recently made in incandescent lighting in this country there was exhibited a 6,000-candlepower incandescent lamp.

MR. W. J. McDOWELL, who for the past three years has been connected with the General Vehicle Company as an electric truck salesman, has joined the staff of the General Motors Truck Company, of Detroit, Mich. Mr. McDowell will act in the capacity of electric truck salesman for Chicago and vicinity. Mr. McDowell is one of the most popular and active truck salesmen in the country. His acquaintenanceship is widespread, and his abilities well known. Mr. McDowell has served as secretary of the Chicago Section of the Electric Vehicle Association of America since its inception two years ago.

OBITUARY.

MR. LUTHER L. NORMAN, who has been president of the Cleveland Switchboard Company, Cleveland, O., for the last 15 years, died last week.

MR. CHARLES A. CHAPIN, president of the Michigan & Indiana Power Company, died of heart trouble on the evening of October 22. Mr. Chapin was born at Niles, Mich., 68 years ago. About 15 years ago he interested himself in the development of electric power in southern Michigan and northern Indiana, establishing his headquarters at Chicago. He is survived by his widow and seven children.

PROPOSALS.

ELECTRIC MINING. — Proposals for electric wiring of the New Hampshire School for Feeble Minded at Laconia are asked for by the Board of Control, Concord, N. H., George W. Fowler, secretary.

EXTENSION OF ELECTRIC-LIGHT SYSTEM.—Sealed proposals will be received by Frank G. Werley, County Commissioner, Allentown, Pa., for furnishing all labor and material for the extension of the electric-light system in the hospital building at the Lehigh County Home.

LIGHTING BETTERMENTS.—Bids will be received at the custodian's office of the United States Post Office, Niles, Mich., for exterior lighting betterments at this building, in accordance with drawings and specifications, copies of which may be obtained upon application to the custodian of the site named.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received at the office of the business manager of the Board of Education, Room 730 Tribune Building, Chicago, Ill., until November 5 for furnishing the electrical equipment in sundry schools. For particulars address the Committee on Buildings and Ground, at the above address.

POWER-PLANT EQUIPMENT.—Bids will be received by Bigerman Brothers, 240 Market Street, Philadelphia, Pa., until November 30 for power-plant equipment, consisting of two 150-horsepower boilers, one 150-kilowatt generating unit, and 150-kilowatt generator and one radial brick stack. Cost, $25,000. Architects Sauer and Hahn have prepared plans.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until November 11 for furnishing 102 electric candlesticks, for delivery at various navy yards, as per Schedule 5,961; four ventilating fans complete with motor, for delivery at the Navy Yard, Philadelphia, Pa., as per Schedule 5,963; and eight portable electric hand drills, for delivery at the Navy Yard, Brooklyn, N. Y., as per Schedule 5,967.

ELECTRIC LIGHTING PLANT.—Bids will be received until one p. m., on November 6 for supplying an electric lighting plant to the city of Bagley, Iowa. Plans and specifications and lists of materials may be obtained from W. H. Grover, Ames, Iowa. The installation will include an oil engine of about 30 horsepower with connections and auxiliaries on direct-current three-wire generator of 20 kilowatts, 220 volts, 1,200 revolutions per minute; 62 cells of storage battery with a capacity of 160 empere-hours; a two-panel switchboard; 10,000-gallon storage tank; a pole-line distribution system and street-lighting outfit.

NEW PUBLICATIONS.

MAGNETIC OBSERVATIONS.—The United States Coast and Geodetic Survey has published the results of observations made at the magnetic observatory nearer Honolulu, Hawaii, in 1911 and 1912, by Daniel L. Hazard. Hourly values of the three components of the earth's magnetic field are given, with summaries of the monthly and yearly average values. Earthquakes and magnetic storms have also been recorded.

THE WIRELESS AGE.—The publication heretofore known as *The Marconigraph*, published by the Marconi Publishing Corporation in New York City, has been rechristened *The Wireless Age*, the October issue forming the first number of the new series. The scope of the publication is being somewhat changed and space will be given to original technical and experimental articles. A serial dealing with wireless measurements is begun in this issue and there are 11 other feature articles.

LONGEST TRANSMISSION LINE.—George J. Henry, of San Francisco, has issued bulletin No. 2, which contains a reprint from the *Journal of Electricity, Power and Gas* describing the system of the Southern Sierras Power Company. This project represents the longest transmission line in the world, the length being 238 miles. The voltage used is 140,000 and the conductors are steel-aluminum. Many points of design of this system are novel and worthy of the attention of electrical engineers.

INTERNATIONAL ELECTRICAL UNITS.—The Bureau of Standards, Washington, D. C., has published the report to the International Committee on Electrical Units and Standards made by a special technical committee appointed to investigate and report on the concrete standards of the international electrical units and to recommend a value for the Weston normal cell. The meetings of this technical committee were held in Washington, in 1910. The publication is in two parts, the first giving the detailed minutes of the committee meetings, the conclusions and recommendations of the committee and a number of appendices containing descriptions of the experiments carried out and other matters of detail. This forms a volume of 207 pages. In a small supplement there is a preface to the report, the circular and resolution of October 15, 1910, and the second and third reports of the Bureau of Standards on the silver voltameter.

HENDRICKS' COMMERCIAL REGISTER.—Established in 1891. Hendricks' Commercial Register of the United States for buyers and sellers develops with each edition into a more valuable compendium of accurate information respecting the manufacturers of practically every conceivable product. This book must be the most complete work of its kind in existence. Its aim is to furnish complete classified lists of manufacturers for the benefit of those who want to buy as well as those who have something to sell. It covers the architectural, engineering, electrical, mechanical, railroad, mining, manufacturing and kindred trades, and professions. The present edition required 138 pages to index its contents, an addition of 16 pages over last year's volume. There are over 55,000 classifications in the book, which embraces 1,635 pages. All manufacturers of a particular trade are classified under a general heading for mailing purposes. Then each firm or corporation is subdivided under as many classifications as every variety of their products call for. Trade names of articles classified in the book are published as far as they can be secured. The publishers are the S. E. Hendricks Company, New York. The book will be supplied for $10.00.

DATES AHEAD.

Electrical Credit Association, of Chicago. Annual meeting, Chicago, Ill., November 14.

National Academy of Sciences. Autumn meeting, Johns Hopkins University, Baltimore, Md., November 18-19.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual meeting, Columbus, O., November 20-22.

American Society of Refrigeration Engineers. Annual meeting, New York, N .Y., December 1-2.

American Automobile Association. Richmond, Va., December 1-3.

American Society of Mechanical Engineers. Annual meeting, New York, N. Y., December 2-5.

National Gas Engine Association, Toledo, O., December 4-6.

American Institute of Chemical Engineers, New York, N. Y., December 10-13.

American Association for the Advancement of Science. Annual meeting, Atlanta, Ga., December 29-January 3, 1914.

Western Association of Electrical Inspectors. Annual meeting, Cincinnati, O., January 27, 1914.

With the Electrical Manufacturers

Ercole Marelli & Company, Limited, maintains show rooms and offices for the United States branch at 35 Broadway, New York City, in charge of L. & E. Frenkel. The address was erroneously stated in a recent issue.

Beardslee Chandelier Manufacturing Company, 216 South Jefferson Street, Chicago, Ill., is sending out to the trade a booklet of holiday suggestions. This deals particularly with artistic portable lamps, of which over 10 are illustrated and briefly described. All of the designs are of high artistic merit and are moderate in price. A special offer is made by the company to dealers for a group of these portables.

The Bristol Company, Waterbury Conn., announces the purchase of the business of the Goodwin Hollow Set Screw Company. Arrangements have been made for the exclusive manufacture of the Goodwin patented hollow safety set screws with the dove-tail slots. Increased facilities for manufacturing these set screws will be provided and shipments are already being made from the main factory of the Bristol Company.

Hotpoint Electric Heating Company, Ontario, Cal., is sending out to dealers of electrical appliances and central stations a folder calling attention to some extensive national advertising that the company is planning for the month of November. A number of well known Hotpoint appliances are to be sold at special prices on certain days. These are described and illustrated in the folder and the value of selling these and other of the company's appliances is pointed out.

Sangamo Electric Company, Springfield, Ill., has published bulletin No. 36, describing and illustrating ampere-hour meters for general service. This is a very handsomely printed publication, and in appearance and in literary contents adds very materially to the reliable literature of the subject. A particularly valuable feature of the bulletin is a study of the uses of ampere-hour meters both for special and general work. To everyone interested in the subject this bulletin is recommended.

Hubbard & Company, Pittsburgh, Pa., are the manufacturers of the Belcher ground-wire clamp. This is a clamp invented and patented by W. E. Belcher, of Bloomfield, N. J., and is particularly designed for the clamping of overhead ground wires to wood, concrete or steel pole lines or transmission towers. This clamp is made in two styles, style J being used for pole lines and style U for towers. Copies of a circular describing this clamp can be obtained upon application to the company or to the inventor.

Standard Underground Cable Company, Pittsburgh, Pa., has issued Bulletin No. 710-1. This deals with indoor cable terminals of the D. S., or Davis station, type. These terminals are made in various forms for single-conductor and multi-conductor cables. Some are made for upright installation and others for inverted use. The bulletin describes the various forms, points out their advantages and gives comprehensive data respecting each type. Near the end of the bulletin are given instructions for installing indoor terminals of this type.

Simplex Wire & Cable Company, Boston, Mass., has received the contract for supplying multiple-conductor cables for a new fire-alarm system about to be installed in the city of Salem, Mass. Most of these cables are lead covered for underground use and contain from 2 to 18 conductors, both in pairs and laid straight. If placed end to end the single conductors in these cables would stretch a distance of over 45 miles. A 30-per-cent rubber compound was specified in order to secure as high grade an installation as possible.

Moloney Electric Company, St. Louis, has established a branch office at 1716 Fisher Building, Chicago. This office will have charge of the selling organization for the north central states. The manager is L. H. Keller. Mr. Keller is a graduate in electrical engineering of the Missouri State University, Columbia, Mo. Directly after graduation he entered the factory of the Moloney Electric Company, and has worked in every department, for the last year being connected with the selling organization, covering the southern and southwestern territory. Mr. Keller is well qualified through technical education and experience in the transformer factory to discuss problems affecting the design and installation of this material.

The W. Green Electric Company, 81 Nassau Street, New York, N. Y., loaned one of its large electric polishing and buffing machines to the United States mint for polishing up coins used in the exhibit of the mint at the recent New York Electrical Exposition. Smaller electric polishing machines were also loaned to the New York Edison Company for use in its model restaurant and kitchen, to the Edison Electric Illuminating Company of Brooklyn and the New York & Queens Electric Light & Power Company for the same purpose. The company has recently been awarded the contract for furnishing the fifth and sixth jewelry departments of Tiffany's famous Fifth Avenue jewelry establishment with a new outfit of 0.75-horsepower polishing and buffing motor lathes.

The H. J. Jaeger Research Laboratories, Incorporated, New York, N. Y., have been organized for the purpose of promoting and developing the incandescent lamp and tungsten industries along independent lines. The incorporators announce that companies will be promoted and factories established for the manufacture of tungsten lamps in various cities in the United States and Canada. Negotiations are being conducted with independent lamp manufacturers for the purpose of establishing them in the manufacture of tungsten lamps under the processes and patents controlled by the Laboratories. Research and development work will be conducted along co-operative lines, each of the allied companies appropriating a certain share for the maintenance of this work. Announcement is made that the Laboratories are working out a new process for the manufacture of lamps and designing new machinery and methods which it is expected will reduce the cost of manufacture. Arrangements will be made for the preparation of technical and engineering data for sales organizations and for general distribution, and the Laboratories will assume the general direction of sales. Connections have been established in Berlin and London, and connections in Vienna and Paris are being negotiated. The officers of the Research Laboratories are Herman J. Jaeger, president; Benjamin Marcus, vice-president; Gus V. Williams, secretary and treasurer. The main office is at 116 Broad Street, New York, and the laboratories are at 68 Hudson Street, Hoboken, N. J.

Wagner Electric Manufacturing Company, St. Louis, Mo., recently celebrated the twenty-second anniversary of its incorporation. For nearly two years previous to its incorporation, the Wagner Company existed as a partnership enterprise, manufacturing alternating-current fan motors. The partnership was incorporated in 1891, in order to secure capital for the expansion of the business for the manufacture of transformers. While building alternating-current fan motors and transformers, continuous investigation and experimentation on single-phase motors was carried out, and resulted in 1897 in the original and basic single-phase motor of the repusion starting and induction running type. It was the first successful single-phase induction motor having satisfactory starting characteristics. The demand for these motors and the regular lines of product became so large that the company soon outgrew the possibilities of further expanding at its Locust Street site. A new site was secured at 6,400 Plymouth Avenue and a modern factory was built. The new home was occupied early in 1907 and it was expected that it would be large enough for many years. After moving out to the Hillside plant the company developed a line of switchboard and portable indicating instruments. Its transformer business grew. A line of polyphase motors was added and a new type of these motors having starting characteristics superior to the usual polyphase motors, was developed. An alternating-current rectifier for charging small

automobile ignition and and lighting batteries, and a single-phase converter for charging electric vehicle batteries and for supplying direct current for moving-picture theaters were the next lines developed. Then came the self-starting, constant-speed, unity-power-factor motor. It became necessary to expand. Buildings could not be erected in time, so the old plant on Locust Street was modernized and reopened for the assembly and test of starters. Now additional room is needed to take care of the standard lines. A large addition to the shops is therefore now under way to meet this need.

Record of Electrical Patents.

Issued by the United States Patent Office, October 21, 1913.

1,076,019. Electrocuting Insect-Trap. H. B. Clarke, Highland Park, Ill. Has an electrocuting grid comprising alternate bars of opposite polarity covering the open side of the box.

1,076,020. Automatic Switch for Telephone-Exchange Systems. E. E. Clement, assignor to Clement International Engineering Corporation, Camden, N. J. Electromagnets operate a spindle with wipers over a bank of contacts.

1,076,026. Lamp Socket. J. Darby, Summit, and C. D. Meeker, Orange, N. J. Covers details of a pull-chain switch.

1,076,027. Storage-Battery Grid. J. N. Davis, Denver, Colo. The frame is coated with an insulating material.

1,076,032. Electrical Connection. P. E. Gilling, East Orange, N. J. For a ball terminal.

1,076,041. Telephone Transmitter. W. Kaisling, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Provides a special construction for the granule chamber.

1,076,051. Door-Operating Mechanism. D. Morgan, Aspinwall, Pa., assignor of one-half to A. H. Leslie. An electrically operated valve for a pneumatic motor.

1,076,054. Electrode Holder. J. Orr, assignor to General Electric Co. For an electric furnace; has adjustable contact plates.

1,076,058. Electric Vapor Apparatus. E. Podszus, Rixdorf, near Berlin, Germany. A mercury-arc bulb with special anode construction.

1,076,069. Electropneumatic Swell-Pedal Action for Pipe Organs. E. M. Skinner, Boston, Mass. Electromagnetically controlled.

1,076,091. Flash-Light Photographic Apparatus. C. D. Allen, New York, N. Y. A circuit-closing and breaking device adapted to be held in the hand and operated by a bulb.

1,076,141. Preparation of Radiothorium. L. Meitner, Berlin, Germany, assignor to Dr. O. Knofler & Co., Berlin-Plotzensee, Germany. Consists in electrolyzing solutions containing radiothorium in large excess and very little thorium and precipitating the radiothorium at the cathode.

1,076,149. Automatic Electromagnetic Switch. J. N. Reynolds and A. F. Dixon, assignors to Western Electric Co. Comprises a rotary shaft with a series of disks and segmental contacts secured thereto, stationary spring contacts being arranged to engage the segmental contacts on rotation of the shaft.

1,076,157. Automatic Heat-Alarm. J. G. Schluchtner, Brooklyn, N. Y. An expansible conductive fluid acts in an alarm circuit closer.

1,076,176. Railway Signaling System. A. L. Vencill, assignor to Union Switch & Signal Co., Swissvale, Pa. Electrically operated through track relays.

1,076,181. Electric Horn. G. M. Willis, Chicago, Ill. Has an electromagnetically operated sounding diaphragm.

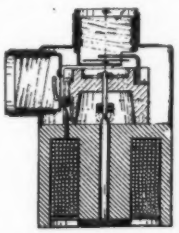
1,076,186. Fastening Device for Electric Fixtures. C. W. Bihler, Chicago, Ill. Includes telescopic means for moving the canopy only in the direction of the wall or ceiling.

1,076,207. Control System. C. C. Heinzmann, Indianapolis, Ind. Thermostatically controlled and electromagnetically actuated damper-regulating motor.

1,076,210. Cataphoric Electrode. D. E. Kerr and H. Wilson, Conneaut, O. Comprises a medicine container with a part adapted for application to the body, a plug secured to its cover and a metallic electrode carried by the plug.

1,076,212. Protecting Mercury-Vapor Apparatus. O. O. Kruh, assignor to General Electric Co. A rectifier with means for preventing the cathode spot from shifting to the anode by equalizing the static stress between the electrodes.

1,076,213. Electromagnetic Separator. E. Langguth, Neerpelt, Belgium.



1,076,236.—Current Tap with Magnetic Hold.

Comprises a rotary magnet and a stationary magnetically induced body adjacent to its path.

1,076,214. Electric Railway and Electric-Motor Control. H. W. Leonard, Bronxville, N. Y. For operating the motors from either a low-tension or a high-tension source with an auxiliary motor-generator.

1,076,217. Commutator-Truing Device. F. G. Ludwig, Lockport, Ill. An abrasive holder is mounted on guides.

1,076,222. Electrical Indicator. S. B. Moscovitz, New York, N. Y., assignor to National Automatic Roll Advertising Co. A motor-driven exhibiting device.

1,076,236. Support for Electrical Taps or Outlets. J. Sachs, assignor to Sachs Laboratories, Hartford, Conn. A current tap with electromagnetic holding coil. (See cut.)

1,076,271. Welding Machine. T. E. Crecelius, assignor to Multiplex Display Fixture Co., St. Louis, Mo. Has electrically heated contact members.

1,076,278. Selective Calling-Key. M. F. Geer and R. C. Leake, assignors to General Railway Signal Co., Gates, N. Y. Includes a current converter, control mechanism therefor and a rotatable contact maker.

1,076,285. Coin Collector. W. F. Hosford, assignor to Western Electric Co. Electromagnetically controlled coin mechanism for prepayment telephones.

1,076,292. Electrode Lead. C. A. Kraus, Newton Highlands, and R. D. Mailey, Lynn, Mass. A mercury electrode in a tube protected inside and outside by a metal sheath not acted on by mercury vapor.

1,076,298. Electric Brake. J. N. Mahoney, assignor to Westinghouse Air Brake Co. Dynamic braking for railway motors.

1,076,303. Selective Signaling System. J. McFell, Chicago, Ill. Includes a series of electromagnets governing a step-up device.

1,076,304. Fire-Alarm and Watch-Service Signaling Means. J. McFell. Provides for an emergency metallic signaling circuit.

1,076,312. Wireless Duplex System. R. Pfund, New York, N. Y. Provides for simultaneous transmission and reception, without mutual interference, of wireless signals or speech.

1,076,332. Governing Mechanism for Centrifugal Compressors. R. Tröger assignor to General Electric Co. A surge-preventing valve governs the controller for the driving motor.

1,076,338. Recording Device. E. S. Votey, assignor to Aeolian Co., New York, N. Y. An electric punch-operating device for a music-roll-punching machine.

1,076,387. Disconnecting Switch. A. J. Pahl, San Francisco, Cal., assignor to K-P-F-Electric Co. For disconnecting a broken high-tension line wire from the remainder of the line.

1,076,394. Thermal Circuit-Closer. J. F. Scheuer, Two Rivers, Wis. A fusible union normally holds the circuit open.

1,076,395. Elevator Signal System. N. L. Schloss, New York, N. Y., assignor of one-fourth each to J. Norden and M. Norden. Includes push-buttons at each floor, a lamp signal in each car for each floor and relays controlling the signals.

1,076,407. Locomotive. H. G. Chatain, assignor to General Electric Co. A gas-electric car in which the base of the engine is extended to form part of the magnet frame of the driving motors.

1,076,418. Lighting Fixture. E. F. Guth, St. Louis, Mo. A semi-indirect unit consists of a canopy inclosing the ceiling outlet and lamp socket and having a flat bottom reflecting surface, suspended from which by the edges is a hemispherical reflecting and diffusing bowl almost entirely surrounding the lamp.

1,076,424. Process of Treating Large Fermentation Vessels. H. Held, Nuremberg, Germany. The interior is first electroplated with copper and then with silver, in each case a small quantity of electrolyte being used and the vessel rotated on rollers during the electroplating.

1,076,427. Testing Installation for

Electromagnetically Operated Sparking Plugs. G. Honold, Stuttgart, Germany. Provides means for establishing a short-circuit to include the winding and cut out the electrode.

1,076,438. Thermoelectric Element. A. L. Marsh, assignor to Hoskins Mfg. Co., Detroit, Mich. Consists of nickel and silicon (the silicon being from 3 to 5%) with a small quantity of manganese added to remove shortness.

1,076,445. Electrocapillary Contrivance. A. Orling, assignor to Orling's Telegraph Instruments Syndicate, Ltd., London, England. Electric impulses are sent from one capillary tube containing mercury to another through an intermediate electrolyte.

1,076,448. Frequency-Indicator. W. H. Pratt, assignor to General Electric Co. Provides means for tuning the circuits of the two windings for different frequencies by means of a reactance and condenser in series with each. (See cut.)

1,076,463. Holder for Shades, Reflectors, and the Like. M. P. Stevens, East Orange, N. J. Comprises spring clamping fingers, an annular cam surrounding the fingers to hold them in clamping position, and a spring to move the cam into holding relation.

1,076,467. Method of Welding. E. Thomson, assignor to Thomson Electric Welding Co., Lynn, Mass. For electrically welding a wheel rim and its center.

1,076,473. Combined Electric Indicator and Steam-Flow Meter. J. Wilkinson, assignor to General Electric Co. An ammeter recording the output of each turbogenerator has a needle on the same dial as the flow meter of the boiler supplying that unit.

1,076,477. Cluster Lamp Socket. C. H. Bissell, assignor to Crouse-Hinds Co., Syracuse, N. Y. The side sockets may be connected in parallel or series. (See cut.)

1,076,481. Electromagnetic Device. S. C. Bryant, assignor to Bryant Zinc Co., Chicago, Ill. A reciprocating device for operating the clapper of a gong.

1,076,485. Storage Battery. W. A. Crowdus, Chicago, Ill. assignor of one-half to A. R. Porter. The two plates are composed of lead sheets with parallel intersticial tubes filled with active material and rolled together with an intervening thin wood separator.

1,076,495. Electric Safety Lamp. E. Gottschalck, L. Werner, and A. Gast, assignors to Chemische Fabrik Griesheim-Elektron, Frankfort-on-the-Main, Germany. Has independent means for breaking the lamp circuit when the globe is broken.

1,076,518. Electric Furnace. I. Rennerfelt, Halmstad, Sweden. Three electrodes project through a rotatable crucible in the center of the furnace.

1,076,530. Electric Firearm. A. Tépins, Paris, France. Provides electric ignition of a detonating cap.

1,076,535. Spark Plug for Explosion-Engines. F. C. Walsh, assignor to Sharp Spark Plug Co., Cleveland, O. Includes clamping means of special construction.

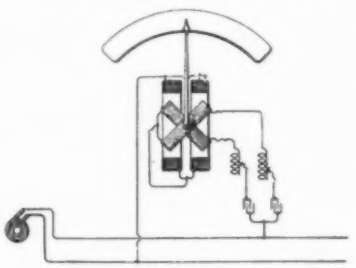
1,076,552. Railway Signal System. D. Dale, Chicago, Ill. An electric safety track signal.

1,076,590. Method of Drawing Refractory Wires. A. J. Liebmann, assignor to N. Hofheimer, New York, N. Y. Tungsten wires are drawn thinner by first passing through a bath of gasoline, rendering part of the wire incandescent by passing an electric current through it, thereby depositing carbon on its surface in the form of graphite, and finally drawing the coated wire through a diamond die.

1,076,607. Thermal Circuit-Closer. J. F. Scheuer, Two Rivers, Wis. A fusible block holds the circuit open normally.

1,076,614. Winding Apparatus. J. G. P. Thomas, Holywell Vicarage, Wales. An electrically driven mine hoist includes a prime mover and a motor-generator set.

1,076,626. Holder for Heavy Shades. W. P. Cartwright, deceased, by M. Cartwright, executrix, assignor to General Electric Co. A yoke supported on the cap of the socket has legs extending down its sides, the shade-holder being seated on the lower end of the socket and detachably secured to the yoke.

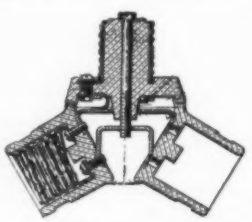


1,076,448.—Frequency-Indicator.

1,076,630. Supporting Structure for Trolley Conductors. H. P. Davis and T. Varney, assignors to Westinghouse Electric & Mfg. Co. A bracket for catenary lines.

1,076,631. Railway-Traffic-Controlling System. F. L. Dodgson, assignor to General Railway Signal Co., Gates, N. Y. Electric-motor-operated semaphore.

1,076,652. Driving Mechanism for Vehicles. E. G. Hoffmann, New Rochelle, N. Y.; A. W. Kiddle and A. Mathilde Becker, executors of said Hoffmann, deceased. A motor vehicle in which the brake is applied only to the armature of the motor.



1,076,477.—Cluster Lamp Socket.

Reissue 13,030. Lamp. E. J. Lutwyche, assignor to C. H. Reynolds, Chicago, Ill. Original No. 1,070,383, dated Aug. 12, 1913. An electric automobile headlight.

Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired October 27, 1913.

569,989. Electric Motor Regulator. W. A. Anthony, Newark, N. J.

570,009. Rheostat. A. C. Dinkey, Munhall, Pa.

570,013. Galvanic Battery. R. W. Gordon, New York, N. Y.

570,019. Wattmetter. G. Himmel, Munich, Germany.

570,028. End Electrode for Electric-Power Storage Batteries. J. Langelaan, Cologne, Germany.

570,034. Insulator. C. B. Martin and E. M. Hewlett, Schenectady, N. Y.

570,046. Electric Signal for Street-Car Crossings. C. A. Parrish, Jackson, Mich.

570,053. Electric Arc Lamp. G. C. Pyle, Indianapolis, Ind.

570,062. Signal Apparatus. J. G. Schreuder, Edgewood, Park, Pa.

570,068. Electric Switch. S. A. Stewart, Waltham, Mass.

570,072. Telautograph. G. S. Tiffany, Highland Park, Ill.

570,077. Electric Heater. E. P. Wetmore and C. E. Roehl, St. Joseph, Mo.

570,078. Trolley for Electric Railways. W. M. Whiting, East Orange, N. J.

570,089. Safety Apparatus for Railway-Crossings. G. Gibbs, Milwaukee, Wis.

570,112. Telautograph. G. S. Tiffany, Highland, Park, Ill.

570,118. System of Distribution for Alternating Currents. C. S. Bradley, Avon, N. Y.

570,119. Electric Car-Motor. C. S. Bradley, Avon, N. Y.

570,125. Apparatus for Producing Wire Bars by Electrodeposition. J. B. Forsyth and C. R. Fletcher, Boston, Mass.

570,133. Apparatus for Electrolytic Deposition. W. D. C. May, Niagara Falls, N. Y.

570,140. Section Insulator. L. McCarthy, Boston, Mass.

570,166. Insulating Joint for Metal or Armored Conduit Tubes. E. T. Greenfield, New York, N. Y.

570,167. Metallic Junction Box and Means for Uniting Metal Conduit Tubes Thereto. E. T. Greenfield.

570,168. Underground Conduit. E. T. Greenfield.

570,169. Conduit Tube. E. T. Greenfield.

570,170. Insulating Joint for Conduit Tubes. E. T. Greenfield.

570,172. Snap Switch. A. B. Herrick, Jersey City, N. J.

570,204. Adjustable Telephone Transmitter. A. Gartner, Newark, N. J.

570,212. Circuit-Breaker. A. J. Wurts, Pittsburgh, Pa.

570,224. Machine for Making Grids for Secondary-Battery Plates. A. F. Madden, Newark, N. J.

570,256. Art of Making Interior Conduits. E. Lavens, Brooklyn, N. Y.

570,310. Electrical Apparatus. J. F. Kelly, Pittsfield, Mass.

570,328. Electric Railway. A. Norman, Toronto, Canada.

570,339. Track Cleaner or Current Collector. W. M. Robert, Jr., Cumberland, Md.

570,373. Electrically Acutated Switch Mechanism. W. S. Browne, Brooklyn, N. Y.

570,406. Automatic Lightning Arrester. G. P. Johnson, Gloversville, N. Y.

570,410. Electric Elevator. F. B. Perkins, Boston, Mass.

570,415. Circuit-Breaker. A. J. Wurts, Pittsburgh, Pa.

570,416. Circuit-Interrupting Device. A. J. Wurts.

570,417. Automatic Circuit-Breaker. A. J. Wurts.

570,418. Switch for Electric Circuits. A. J. Wurts.

570,419. Circuit-Breaker. A. J. Wurts.

570,424. Electric Motor. S. G. Brinkman, New York, N. Y.

Electric Vehicle Section

ELECTRIC VEHICLE ASSOCIATION OF AMERICA.

Fourth Annual Convention, Chicago, Ill., October 27 and 28.

Central-station men, electric-vehicle manufacturers, accessory manufacturers, dealers and users to the number of 351 assembled in Chicago on October 27 and 28 on the occasion of the fourth annual convention of the Electric Vehicle Association of America. No better indication of the concrete advances that are being made in the electric-vehicle industry can be desired than the interest manifested by these correlated agencies in the convention. Without exception, the papers and reports presented for consideration all were indicative of marked progress in the design of vehicles and accessories, in their wider application and in the co-operation of all elements interested in the development of the industry. There is no doubt that the Chicago convention will be productive of excellent results and will long be remembered as a banner meeting of the Association.

In addition to the purely business aspects of the meeting, mention should be made of the numerous diversions provided for the entertainment of the delegates. The principal feature was the dinner on Monday evening which was followed by an automobile inspection trip of several prominent electric garages and a cabaret and entertainment on the return of the party to the hotel.

Tuesday noon the Commonwealth Edison Company tendered the convention a luncheon, at which L. A. Ferguson, vice-president of the company, spoke.

Business sessions were held both morning and afternoon of Monday and Tuesday. The first session was called to order by Arthur Williams, of New York, president of the Association, shortly after 10 a. m. on Monday. The chair was turned over to Frank W. Smith, vice-president, and the annual presidential address delivered by Mr. Williams.

President Williams spoke of the growth of the Electric Vehicle Association and the establishment of a geographical section on the Pacific Coast, which is being contemplated. He advocated additional geographical sections so that the Association would ultimately be represented in every section of the country through local organizations. He spoke of the growth of the industry from the manufacturing standpoint, there now being 37 manufacturers engaged in electric-vehicle production. There are approximately 37,000 passenger cars, electrically propelled, in use in the United States and about 12,000 commercial cars. He spoke of one field of the electric—namely, the handling of freight at docks and warehouses and pointed out that the absence of fire risk is one of the most important considerations. Interesting statistics relative to the development and application of electric vehicles were presented and will be treated at greater length in a subsequent issue.

Vice-president Smith appointed a committee composed of Hayden Eames, E. E. Witherby, and W. P. Kennedy to consider the president's address and report at a subsequent session.

The report of the secretary, Harvey Robinson was then introduced. This report indicated the vast volume of work that the secretary's office is called upon to transact during the course of the year. Early during President Williams' administration it became necessary to establish the office of assistant secretary and the assistance thus extended to the office has been of great benefit in carrying on the work of the Association. The report shows a decided increase in members, the total membership to date being 439, of all classes. This figure does not take into consideration the numerous applications received during the convention.

Day Baker, treasurer, then presented his report, which enumerated the expenditures made during the year under the three funds into which the proceeds of the Association are divided.

The report of the Committee on Legislation was then presented by E. W. Curtis, Jr. This report outlines the activities of the Committee during the year in regard to legislation affecting automobilies. In New York the Committee was successful in having withheld legislation that would unduly tax the motor-driven vehicle. The Committee hopes that the laws of the various states may be standardized and uniform legislation obtained.

The report of the Committee on Operating Records was then presented by William P. Kennedy, chairman. This report consists of certain tabulated data which gives general average operating costs of commercial electric vehicles ranging from 700 pounds to 10,000 pounds capacity. Mr. Kennedy added that a blank form had been drawn up by the Committee on which data such as published in the table could be compiled and submitted to the Association for consideration. A brief discussion followed the presentation of this report, the principal point being the advisability of presenting such general data. Questions relative to the price of current figured in the table; mileage of the vehicles per day; charges for garaging service, etc., were asked by C. D. Marsh, S. G. Thompson, J. A. Hunnewell, E. S .Mansfield, W. H. Conant, Day Baker, and C. F. Smith. In reply to these questions, Mr. Kennedy stated that all available data were considered in the compilation of this report, which is in a measure a compromise of all figures previously presented. Roughly, 10 per cent of the total operating cost has been allotted as the cost for current. Mileage is based on the rated capacity of the vehicles in each class. Mr. Kennedy added that in view of the desire on the part of the Association to know the basis upon which the table was figured, this information will be published when the table is finally revised.

George H. Jones called attention to the lack of specific data on the operation of electric vehicles and suggested that such figures as those presented by Mr. Kennedy for particular installations be compiled and submitted in a form similar to that used by the National Electric Light Association in compiling its power data.

The report of the Committee on Insurance was then presented by Day Baker, chairman. This report outlines the activities of the Committee in securing a lower liability insurance rate on electric vehicles over other forms of motor-driven cars. In this the Committee was successful insofar as New England is concerned, and a rate practically 20 per cent lower than the standard rates for gasoline-driven automobiles and trucks has been obtained.

Stephen G. Thompson then presented the report of the Committee on

Papers, which gives a summary of topics which have been presented before the Association.

The report of the Committee on the Establishment of Courses of Instructions in Electric Vehicle Practice was next presented by Charles Blizard. This report describes the work done in connection with the establishment of an electric-vehicle school in Cleveland under the auspices of one of the technical high schools located there. The course seems to be meeting with great favor among students. The Committee is at present endeavoring to establish similar courses in other cities, and suggests that such a course be introduced in the Y. M. C. A. departments of instruction.

The report of the Committee on Rates and Charging Stations was next presented by John F. Gilchrist, of Chicago, chairman. This report states that comparatively little change has been made by the public garages toward making separate charges for the current actually used; the prevalent practice being a monthly rate depending upon the size of the vehicle, or a flat rate per charge. Curves are presented showing the characteristics of the battery-charging load, and attention called to the desirability of this class of business. Reference is made to the Hartford Electric Light Company's battery-service system under which the company maintains charges and installs in customers' trucks all batteries necessary for continuous operation. Mention is also made of the practice of the Washington Water Power Company in this connection. The bulk of the Committee's report comprises tabulations on rates and charging stations. One table gives the rates per kilowatt-hour earned by public and private garages from 128 cities. Another table gives the detailed charging rates maintained by the central-station companies in these 128 cities. A third table gives a list of charging stations in these cities, both public and private, enumerating also the garage rates in effect. Another table gives the number of electric vehicles, both passenger and commercial, in each of the 128 cities covered by the report. This table classifies the vehicles above and below 4,000 pounds capacity. The last table gives the name of the central station in each city, the number of electric vehicles in the company's service, whether or not it maintains its own garage, and whether or not public charging is furnished.

A brief discussion followed the reading of this report, dealing principally with some typographical errors which occured in printing.

President Williams then appointed a Nominating Committee, consisting of E. W. Curtis, Jr., R. L. Lloyd, E. S. Mansfield, Charles Blizard, and George H. Jones, chairman.

At the session on Monday afternoon, the chairmen of the various geographical sections reported on the activities of their sections during the past year. Homer E. Niesz, speaking for Chicago, outlined the principal features of the year's work, among which were mentioned the picnic held jointly with the Garage Owners' Association; the activity of the Section in conjunction with other local automobile associations in giving the children from the various orphan institutes of the city an automobile ride; and the promoting of an automobile parade in conjunction with the Perry Centennial celebration. As a result of this activity, 57 electric vehicles were entered in the parade as compared with 39 gasoline vehicles. One prize for the best decorated truck, two for the best decorated passenger vehicles, and one for the largest number of trucks of one make which were in the parade, were all given to electric vehicles.

In discussing this report, E. E. Witherby spoke of the need of co-operation from passenger-car manufacturers. He complimented the Chicago Section on its activities, but stated that there was a dire lack of co-operation from these manufacturers. He stated that it is as essential for the passenger-car dealer to convince the business man of the merits of the passenger car as it is for the commercial car manufacturer to convince him of the superiority of the electric for transportation service.

The report of the New England Section was presented by J. A. Hunnewell, chairman. This report tabulates the papers presented during the past year and mentions some of the general work taken up. One important feature has been the securing on the part of the Section of the dismissal of the Massachusetts Motor Truck Fee Bill, which endeavored to secure a greatly increased registration fee for trucks, both gasoline and electric.

The report of the Electric Motor Car Club of Boston was then presented by Day Baker, president. This report likewise chronicles the activities of this organization during the past year, much of which work has been given considerable prominence in our reading columns. A considerable portion of this club's activities is directed toward advertising and general publicity work, and very satisfactory returns have been received.

The report of the New York Section was read by Harvey Robinson. This Section has various committees doing active work in investigating various important features relative to electric-vehicle operation in Manhattan. In connection with the New York report, President Williams spoke of the plan of the Section which contemplates acquiring and conducting a model electric-vehicle garage, centrally located, equipped with complete repair shops, battery room, etc. A school will also be established at this garage which will be a branch of the New York Edison School of Instruction.

A paper entitled "The Merchant, the Central Station, and the Electric Truck" was then presented by F. Nelson Carle.

Merchant, Central Station and Electric Truck.

Mr. Carle's paper makes a strong plea for active co-operation by central stations in the work of popularizing the electric truck among merchants of all classes. The increasing use of electricity is the result of greater publicity and education, chiefly through advertising. The central station is called upon to advise the public on things electrical and, because it enjoys public confidence, to act in the relation of a consulting engineer. Since it is the logical advocate of the electric truck, the manufacturer of the latter seeks its active co-operation in agitating its increased use. By such aid in the publicity work the truck manufacturer will be able to effect a material reduction in his selling costs with benefit to all concerned, by reason of the increased use of the trucks. By means of relatively inexpensive advertising the central station can easily stimulate interest in the electric trucks and greatly increase the sale of off-peak current. The educational work of the Electric Vehicle Association's work has been splendid in its national scope; it should be backed up by local effort. Indifference to the electrical truck on the part of central stations is very short-sighted; not only is there no reason for it, but it keeps the central station from developing a most advantageous load. If the same effort were expended in electrifying the work of the 10,000,000 city horses that is spent in going after the isolated plants, the merchant, the central station and the electric truck manufacturer will all do business on a much higher remunerative basis.

C. D. Marsh opened the discussion, commenting on the suggestion made that central-station companies endorse the electric truck through local newspaper advertising. He strongly advocated this practice.

E. E. Witherby commented upon the lack of co-operation from central-station companies, which is still apparent in many localities. He called attention particularly to one central station in a middle western city which had recently ordered 18 gasoline trucks for use in its own service in spite of a plea of all those interested in the electric vehicle that central stations should endorse the electric by using it in its own transportation department.

Day Baker pointed out that it is significant that in every town where central-station co-operation is extended, the development of the electric vehicle is marked. This is due, particularly, to the fact that manufacturers must necessarily confine their activities to such localities

There Will Soon Be 1000 G. V. Electrics in the Service of Central Stations

The picture below is but one example of G. V. adaptability. G.V. Electrics lead in operating efficiency, long life and minimum upkeep. Write for Catalog 85.

General Vehicle Company, Inc.

General Office and Factory - Long Island City, N. Y.

New York Chicago Boston Philadelphia

where this co-operation is extended. He cited several New England towns as indicative of this tendency, namely, Hartford, Conn.; Worcester, Lowell and Springfield, Mass.

George Smith thought that the Electric Vehicle Association should endeavor to co-operate with central stations through their state associations.

R. L. Lloyd emphasized a point made in the paper that every horse in service should be considered as an isolated plant. He thought that if this statement was called to the attention of central stations, they would perhaps look at the promotion of electric-vehicle business in a different light.

W. H. Conant thought that it was a function of the Electric Vehicle Association to reach the electric-service companies not already members of the organization. Brief remarks were also made by Messrs. Hewitt, E. S. Mansfield and J. A. Hunnewell.

At this point, J. F. Gilchrist of Chicago was called to the chair. A paper by E. L. Callahan, of Chicago, entitled "Co-operation Between the Electric Vehicle Manufacturer and the Central Station" was then presented. This paper, which contains timely, constructive criticism, is published in another part of this issue.

C. D. Marsh, E. S. Mansfield, S. G. Thompson, Day Baker, W. P. Kennedy and H. H. Rice discussed this paper.

A very interesting paper entitled "Traffic Problems and the Automobile," was then presented by Dr. E. E. Pratt.

Traffic Problems and the Automobile.

Dr. Pratt's interesting paper deals generally with traffic problems in our largest cities and particularly with those in New York. Restrictive legislation aims chiefly at two evils, dangerous speeding and excessive wear and tear of street surfaces. The McAneny ordinance proposed for New York City was based on an extensive study of traffic conditions, in which it was found that the three difficulties most needing correction are too narrow tires, excessive loads and expensive widths of vehicles, the ordinance sought to impose penalties to overcome these. The most thorough study of street accidents made is that in London, where it was shown that motor omnibuses are causing a rapidly increasing number of accidents. On anaylsis the main causes of street perils are the presence of fast and slow traffic on the same street, the presence of double-deck tramcars in the center of the road and the tendency of fast vehicles to shoot past slow vehicles as opportuity offers. Conditions as to street hazards are worse in this country than abroad, but the public is gradually becoming educated to avoiding street-car accidents at any rate. Many suggestions have been made for segregating fast and slow traffic in different streets or parts of wide streets. Traffic congestion is due mostly to the variety of vehicles in the streets and is most aggravated at railroad freight terminals and docks. If only automobiles were used and all horse vehicles banished the problem would be practically solved. Automobiles, although complicating the traffic problems, for the time being at least, have also helped relieve some of them. They reduce the number of vehicles necessary to handle the same volume of goods hauled; they take up less space in the street and in storage; they are much more flexible and more easily controlled; their higher speed reduces traffic congestion. The biggest problem of the manufacturer in a large city is the trucking of his raw materials and finished products. To solve it requires careful study of systematic arrangement and regulation of freight terminals. The automobile manufacturers and dealers must take up this problem, because the present congested terminals do not favor the use of automobile trucks that are apt to be tied up for hours instead of being in active running as much as possible.

This paper was discussed briefly by Messrs. Mansfield, Kennedy, Curtis and Hale. It was brought out in the discussion that the surface of the street does not suffer as much as the street structure. The work of the Massachusetts Institute of Technology in connection with a study of road conditions it was pointed out could be duplicated in Chicago and New York by local universities.

The session on Tuesday morning was called to order by President Williams at 10:25 o'clock. The report of the Garage Committee was presented by E. S. Mansfield.

This report was made up of a number of separate reports from local committees in New York, Boston, Chicago, Indianapolis, Newark, Rochester, St. Louis, Philadelphia and Washington. These reports cover the conditions in the various cities named, details of which cannot be given here.

This was discussed by C. K. Chapin, C. A. Street and Arthur Williams. The discussion was concerned with the point raised by Mr. Chapin, whose company operates a public garage in Memphis, Tenn., but has no agency for selling vehicles and has not been allowed by the manufacturers discounts on parts needed in repairs. A motion was passed by the Association to recommend to the manufacturers that they should allow the same discounts to garage managers as to dealers. It was pointed out that the manufacturers' agencies are glad to have the repair work taken over by the garage and would make no objection to such an arrangement.

G. H. Jones then made a report for the Nominating Committee and the chair appointed H. C. Cushing, Jr., R. E. Russell and John Meyer as inspectors of election, the balloting being done between 12 and 2 p. m.

Hayden Eames then made the report of the Committee on the President's Address. The committee commended this address highly and recommended that it be printed with the addition of statistics for the electric vehicles in the city of Cleveland.

Maxwell Berry then presented a paper entitled "Charging of Batteries in Unattended Garages."

Charging of Batteries in Unattended Garages.

In opening his paper, Mr. Berry called attention to the fact that in the smaller cities and in the case of pleasure cars and of commercial vehicles used by small establishments, the vehicle is cared for usually in a private garage, the equipment of which must be such as requires minimum attention. Taking up apparatus for battery charging, Mr. Berry discussed the four classes of providing a direct charging current from an alternating-current supply source. These he classified as chemical rectifiers; mechanical, commutator or vibrating-reed rectifiers; mercury-arc rectifiers; motor-generator sets. He dwelt on the advantages and disadvantages of each method, and pointed out that in his opinion the mercury-arc method for battery charging has more disadvantages than advantages. In regard to motor-generators he showed that the vertical high-speed type machine possesses a number of advantages, among which are high commercial efficiency, flexible voltage range, close regulation at variable line voltages, automatic restarting and flexible adjustment for tapering or constant-current charging. He then took up the inherent constants of a charging battery and showed that a gradually rising electromotive force together with an increasing battery resistance were the most practical indications of the termination of a full charge which could be effected electrically by an automatic device. He also discussed the effect of a number of variables on lead-battery potentials and showed that a maximum-voltage charge cutoff is most conducive to complete and thorough charging

This was followed by a paper on "Electric Vehicle Salesmanship," by George H. Kelly and E. J. Bartlett. Mr. Kelly presented the paper.

Electric Vehicle Salesmanship.

The two fundamental principles of salesmanship are knowledge and perseverance. The particular problem which presents itself to the Association is co-operative salesmanship between manufacturer and central station. Most central-station men have preconceived ideas as to how a car should be built, its mileage, speed, cost, etc., irrespective of the experience of the manufacturers. They should accept the manufacturer's designs as fixed for the time being and these offer a sufficiently wide range. Criticism of present types and deviations from standard construction raise doubts among purchasers as to whether the cars are what they should be. Unfortunately most central stations have information regarding only one make of car. The average central-station man knows less about the electric vehicle and its application than any other class interested in the sale of vehicles. The author's company prepared a 13-page document describing a plan for establishing and operating a vehicle section by the central station in the new-business department. This included suggestions for establishing a vehicle section; the method for building up a mailing list;

rates and advice for the use of billboards; samples of newspaper advertising and offer of cuts; suggestions regarding the use of electric signs; the employment of a salesman, etc. This was sent to 1,400 central stations, including every city of over 25,000 population, and about 20 replies were received, of which less than half showed interest in the proposition. The result proved that the central station is not ready to work with any one manufacturer. They may be willing to work through the Electric Vehicle Association and there is a great opportunity for the Association to tabulate and distribute data among them. The following points might be covered: instructions for establishing a vehicle section; a list of manufacturers, including a brief history, business standing, list of products and a chart of the various types; a booklet on care, charging, etc.; a sales manual; pamphlets for distribution; mailing lists and form letters; posters; copy and cuts for newspaper advertising; suggestions of methods for getting local companies to act as manufacturers' agents; forms for the tabulation of local data.

The discussion was opened by C. K. Chapin who, as a central-station man, engaged in operating a garage, thought that the lack of proper knowledge of electric vehicles was not characteristic of the central-station men alone. He suggested that the manufacturers' salesmen should be instructed to visit garages in every city in their territory and get acquainted with the men handling them, especially with the mechanics doing the work. They should also be better informed on subjects concerned with complaints and failures of cars to give expected service.

F. O. Creager thought there were extenuating circumstances connected with the ignorance of central-station men about electric vehicles, since it is hard for them to obtain the facts regarding operation and costs from the manufacturer. This as well illustrated in the report presented the previous day by Mr. Kennedy. The central-station man is perfectly willing to learn but finds it difficult to get the definite information.

Hayden Eames answered this by stating that at least five manufacturers of vehicles had to his knowledge circularized the central stations, giving the very figures desired pertaining to cost of operation, etc.

W. H. Conant thought that the manufacturer in dealing with the central station should not get his vehicles introduced on the basis of setting an example in the use of vehicles, but should go directly to the operating department and convince its head that the electric vehicle was the best thing to use. This would tend to bring out the facts and the arguments showing the advantage of the electric vehicle very plainly before the central station. He also thought that vehicle salesmen should first have worked in the shops of the manufacturer.

E. S. Mansfield divided the central-station men into two classes; those who were interested in the subject and those who did not know anything about it. The men in the first class usually know what customers want and the manufacturers should pay some regard to their demands, as there is not always available a type of vehicle suited to some particular use.

E. W. Jackson held up the central station in Denver as an example of what might be done. That city now has 914 cars in operation. The central station can well afford to maintain a vehicle department and its representatives should visit the factories of the manufacturers.

E. E. Witherby pointed out the uselessness of the central station and manufacturer trying to pass the blame from one to the other and advocated co-operation between them. The association should have a committee to formulate a plan for such co-operation. He thought that every contributor to the publicity fund would welcome its expenditure for this purpose, rather than for general advertising.

David F. Tobias then presented a paper entitled "The Electric Vehicle In Department-Store Service." This described the garage equipment and the vehicles of Gimbel Brothers in New York City, which firm is operating 83 electric and 43 gasoline vehicles in delivery service. These are housed in six garages, with the bulk of them in a main garage where all repairs are done. The average daily mile-

A Boost at Noon and Home soon.
Edison-Nickel-Iron-Alkaline Storage Battery
The Batteries in this Electric Truck can be "Boosted" (charged) at several times their Normal Rate during the noon hour —they must, therefore, be Edison.
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Boylston
LAGER BEER
KAFFENREFFER & CO.
TRY OUR MALT WINE
A NUTRITIVE TONIC
BREWED ON HONOR
ESTABLISHED 1870
Edison Storage Battery Co.
105 Lakeside Avenue
Orange, N. J.
Edison-Guaranteed for four years.-Edison Edison Edison
Guaranteed for 4 years.

age is over 30. An important feature of the management is the maintenance of the rolling stock in as nearly perfect condition as possible. Difficulties are anticipated by disassembling and rebuilding each car every year. All repairs are done by special attendants and the duties of the drivers do not extend beyond polishing the brass work. With this system the same number of vehicles has handled an increase of 25 per cent in number of packages during the past year. A complete stock of parts obviates any delay in repairs. A dispatcher inspects each machine before leaving the garage and between trips, and the danger of running out of power is generally obviated. The number of tow-ins averages six per week during unfavorable weather and road conditions.

C. F. Smith said that with such a method of car maintenance it is not necessary to make any depreciation charge, since a car will last indefinitely and would only be displaced from service through improvements in the art. His tow-ins had averaged only one for 8,500 miles of travel, whereas with gasoline cars the average had been one in 3,000 miles.

Day Baker regarded this paper as an excellent advertisement for the electric vehicle and thought it should be distributed to every merchant in the country.

F. W. Smith stated that Mr. Duerr, who is manager of the Gimbel garages, had formerly been agent for a gasoline car, but had become thoroughly convinced of the superiority of the electric truck.

Bruce Ford then presented a paper entitled "Recent Developments in the Lead Battery for Electric Vehicles."

Recent Developments in the Lead Battery.

Mr. Ford's paper deals almost exclusively with improvements made recently in the Ironclad-Exide storage battery. He reviewed first the developments in this type of cell since its introduction about three years ago. Among the changes made was a slight reduction in the dead weight of the negative grid so as to permit a slightly reduced thickness of the negative plates and thus a greater thickness to the separators and a larger clearance for acid. The sheathing at the top and bottom of the plates has been slightly altered. All these changes have given the positives a life nearly equal to that of the negatives. The demand for greater mileage in electric vehicles has created a demand for batteries of higher specific capacity. As long as boosting of the battery during the middle of the day was looked upon with the same fear as excessive charging, it was necessary to provide a larger battery. But now it has become well established that boosting is not only highly desirable, but that it does not injure the battery. In fact, by giving a boosting charge in the middle of the day the total capacity of the battery does not have to be quite so large, or a battery of fixed size will have a larger mileage if boosting is resorted to. Tests made of Ironclad-Exide batteries that were charged continually show no appreciable alteration in the plates after 16 months, thus showing that the undesirability of heavy charging that is usually true of ordinary cells does not effect this type of cell.

Mr. Rabinalt stated that his experience had been different from that of Mr. Ford. He had overcharged batteries for four weeks at three times the normal rate and found that the Hycap battery with 25-per-cent greater area than the ordinary plate had about 50-per-cent longer life.

J. M. Skinner stated that in his experience the flat type of plate had given results equal to any other.

Day Baker told of his experience with a two-ton truck containing a thin-plate battery which was regularly boosted at noon at a high rate. The plates lasted 18 months. In a smaller vehicle without the boosting charge the plates had lasted a shorter time. He explained this on the ground that the boosted battery was seldom completely charged; whereas, the other battery was occasionally discharged beyond the safe point. He inferred from this that boosting was advantageous in prolonging the life of the battery.

Mr. Harris reported on a list of questions which had been submitted to the member companies for report to another association. The answers received showed marked differences in practice. He intended to tabulate the results received in order to show why better results were obtained in certain cases than in others. Most of the replies did not favor using old negatives with new positive plates. He did not think that this opinion could be justified in general, however, since with proper treatment the negative should be in good condition when the positives were used up. He gave definite figures for results on plates of several different thickness which showed good results by using the negatives a second time. They should not be used, however, in cases where they would limit the life of the new positives.

The second question dealt with the method for determining when the battery is fully charged. The most popular method was from the voltage rating; others used specific gravity or gassing as a guide. He considered the simplest way the most preferable. In only one case was the ampere-hour method in use.

Mr. Ford in closing answered a question of W. H. Conant by stating that the same material was used in both Exide and Hycap plates. Answering Mr. Rabinalt, he attached no importance to the comparison between Hycap and the standard plate in such service, since neither one was suited to it. The Ironclad plate was the only one that could stand such treatment.

An amendment to Article V of the Constitution was adopted, providing that the chairmen of the various sections should be associate vice-presidents of the Association and ex-officio members of the board of directors.

The afternoon session was called to order at 2:30 p. m. and President Williams announced the filing of a petition for the establishment of a branch of the Society in Philadelphia. This matter was referred to the incoming Board of Directors.

At this point, H. C. Cushing was called upon to report the result of the teller's count in the election of officers. Mr. Cushing announced that the following officers were unanimously elected:

President, Frank W. Smith, New York.

Vice-president, John F. Gilchrist, Chicago.

Treasurer, Day Baker, Boston.

New members for the Board of Directors: Arthur Williams, W. P. Kennedy, C. N. Stannard, and W. G. Bee.

The report of the Committee on Publicity and Advertising was then presented by Frank W. Smith, chairman. This report outlines in detail the work of the committee since the publication of the last report. After all expenditures in connection with the advertising campaign carried on last year, a balance of $349.30 was turned over as a basis for the 1913-14 campaign. At the time of the completion of this report, the total subscriptions for this campaign amounted to $34,046.38 received from 107 contributors. The advertising this year will be of a more direct character than that of last, from which no direct returns were expected. However, over 2,000 inquiries were developed as a result of this advertising. The report calls attention to two very attractive booklets which have been prepared dealing respectively with the passenger car and commercial car, which will be sent out in answer to advertising inquiries, and which will also be available for central-station companies wishing to distribute these, at a nominal cost.

Frank H. Gale, in discussing this report, thought that a very important part of the Committee's work is embodied in the preparation of the two publications referred to.

J. S. Codman then recited the details of the trip which Col. S. M. Bailey is making in an electric car from Boston to Chicago via New York. Col Bailey covered the distance from Boston to New York at an average speed of 22 miles an hour, running time. He attended the Electrical Show at New York and then started for Chicago, stopping at Albany, Schenectady, Syracuse, Buffalo, Erie, Ashtabula and Cleveland. Up to this point no mishaps had been encountered and a splendid record was being made. However, leaving Cleveland, Col. Bailey experienced inclement weather and disastrous road conditions which seriously hindered the progress of his car, and when last heard from he was leaving To-

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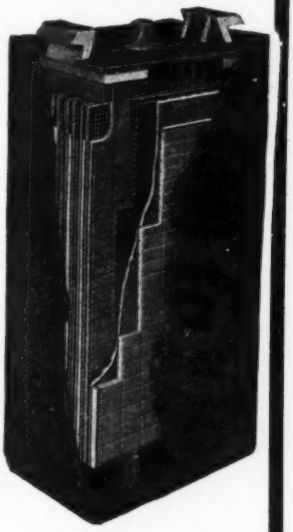

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ledo, O., and expected to reach Chicago one day after the Convention had adjourned.

A paper entitled "Electric Commercial Vehicle Tires," by F. E. Whitney was then presented by E. R. Whitney. This paper calls attention to the relationship between various parts of an electric vehicle and the part that the tires play. While radical improvements and changes have been made in all parts of electrics, one of the most notable improvements has been in the tires, the life of which has been increased 100 per cent and the cost reduced 50 per cent. In this paper, solid tires only are considered. There are two types of these, namely, the endless tires and the block tires. Considering these two classes, the author discusses the features of efficiency, durability, resiliency, weight and cost, in the order named. Various tests made to determine the efficiency of tires, were described and performance curves shown.

E. R. Whitney then presented the report of the Committee on Standardization.

A very brief but interesting address was then delivered by Ralph Temple of Chicago, in which he pointed out that organization and co-operation are absolutely essential if the electric-vehicle industry is to advance as it should. He spoke briefly of the service feature in connection with electric cars and stated that on the continuance and improvement in this respect depends, in a large measure, the future advancement of the industry.

Vice-president, John F. Gilchrist then was called to the chair, and spoke briefly relative to Association work for the coming year. He thought that the most important function is to interest central stations and gain their co-operation in the movement. In Chicago, for instance, there are approximately 100,000 draft horses. If these could be displaced by electric vehicles in ten years, the additional revenue to the Commonwealth Edison Company would be approximate $5,000,000. Comparatively, the same situation exists in other cities.

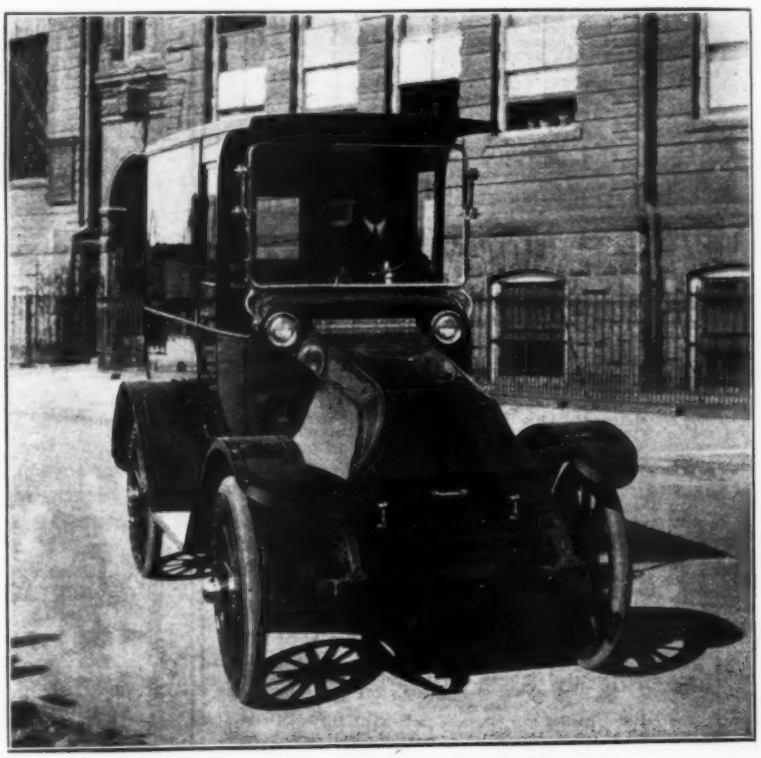
While no extensive exhibits were maintained by any of the manufacturers, several occupied rooms on the eighteenth floor of the Hotel La Salle in which sample boards were displayed, photographs shown, and literature distributed. Among the companies maintaining such headquarters were the Goodyear Tire & Rubber Company, Edison Storage Battery Company, General Electric Company, General Motors Truck Company, Gould Storage Battery Company, Electric Storage Battery Company, Baker Motor Vehicle Company, General Vehicle Company, Walker Vehicle Company, Sangamo Electric Company, Electric Products Company, and the Commonwealth Edison Company.

General Vehicle Company Develops New 1,000-Pound Shaft-Drive Electric Wagon.

The General Vehicle Company, Incorporated, Long Island City, N. Y., has adopted a new type of construction for its 1,000-pound electric wagon, aiming to secure the vehicle best meeting the requirements of delivery systems.

The new wagon, an illustration of which is shown herewith, has a length of 72 inches, a width of 41 inches, and a heighth of 60 inches. These dimensions are the same as the present 1,000-pound vehicle, as they have been found adequate for the merchandise carried.

The wheel base has been increased to 108 inches, approximately one and one-half feet greater distance. This gives an easier riding and more flexible vehicle. The frame, however, has been made narrower allowing the front wheel to be turned at a sharp angle, keeping down the turning radius of the vehicle.



New 1,000-Pound General Vehicle Delivery Wagon.

The frame is of four-inch heat-treated pressed steel. This is a change from the rolled steel channel, and is aimed to give a frame of less weight with sufficient strength for the required load and speed. Semi-elliptic front and rear springs, respectively 46 inches and 54 inches, are provided. The axles are drop forged, one-inch beam section for the front, with full floating characteristics for both front and rear axles. The wheels are of the artillery type on Timken roller bearings. The service brake is internal-expanding, on each rear wheel, controlled by foot pedal. The emergency brake is external-contracting, on each rear wheel, controlled by separate foot pedal.

The steering gear is of the semi-irreversible type with raked steering column and large hand wheel.

The vehicle is equipped with a single motor drive, with double universal shaft and worm drive for the rear axle. The worm is of the latest Brown type, with steel worm and bronze worm-wheel on the bevel-gear differential.

The standard chassis accommodates either G. V., G. V. X., Iron-Clad or Edison batteries in such units as to give the necessary mileage desired.

The controller gives four speeds ahead and two reverse. All wires, including bell and lamp circuits, are in rigid metal conduit.

The vehicle is equipped with a controller throw-off, emergency brake lock, and a running switch lock.

A speed of from 12 to 15 miles per hour may b secured over hard and level roads when the wagon is loaded to its rated capacity. At 12 miles an hour the vehicle has a range of from 45 to 65 miles, and at 15 miles per hour a mileage of from 40 to 50 miles.

The chassis equipment includes a hood, mud-guard, running boards, bell, hub-odometer, tail lamp, kit of tools and charging plug with 12 feet of cable.